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THE

BOOK OF BUTTERFLIES,

SPHINGES, AND MOTHS.

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THE

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THE

BOOK OF BUTTERFLIES,

SPHINGES, AND MOTHS;

ILLUSTRATED BY

ONE HUNDRED AND FORTY-FOUR
ENGRAVINGS,

COLOURED AFTER NATURE.

BY

CAPTAIN THOMAS BROWN,

FELLOW OF THE LINNÆAN SOCIETY, MEMBER OF THE WERNERIAN,
KIRWANIAN, AND PHRENOLOGICAL SOCIETIES, AND
PRESIDENT OF THE ROYAL PHYSICAL SOCIETY.

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THE

BOOK OF BUTTERFLIES.

GENUS SPHINX, OR HAWK MOTHS.

THE insects of the genus Sphinx are sometimes, in Britain, called Hawk Moths. They have, in general, a large thorax, and thick body, most usually tapering towards the tail, or posterior extremity.

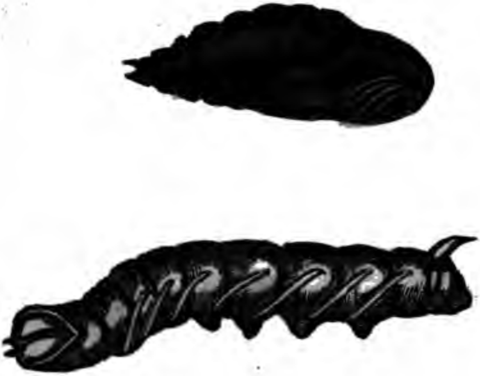
The name of this genus is derived from the position assumed by several of the caterpillars of the larger species bearing a strong resemblance to that of the Egyptian Sphinx, the fore parts being elevated, and the rest of the body adhering flatly to the surface on which it rests.

The flight of the larger species is generally in the twilight of evening, or early in the dawn of morning. Some of the smaller ones are to be met with during day, although they are much more rarely seen than butterflies.

This tribe feeds on the nectar of flowers, which they extract with their long flexible tongues.

The caterpillars have sixteen feet, and are mostly very active in their habits; those of the Linnæan division, called *Zygœnœ,* are thick, fat, and covered with short hairs; those of the *Sesiœ* are generally smooth, unarmed, and thinner towards the head; the others have usually a sharp, erect, stiff horn behind. The pupæ are quiescent; those of the *Zygœnœ* folliculate, and a little tapering forwards; the rest naked and smooth; those of the *Sesiœ* pointed at each end—of the others, very obtuse behind; and many of the species spin their cocoons under ground, making them up with small particles of earth and grains of corn, interwoven with silky filaments.

The caterpillars of some of the sphinges, more particularly that of the Privet Hawk Moth, when in a state of repose, hold firmly with their fore legs the branch on which they are standing, and erect the anterior part of their body so as to form nearly a right angle with the posterior, and remain motionless in this singular attitude for hours. By this means they elude observation, and may be taken for the twig of a tree. It is mentioned by Reaumur, that a gardener in the service of Jussieu, the celebrated botanist, used to be much annoyed at the appearance of these caterpillars; he conceived that the self-sufficient air which they manifested indi-



61.

PUPA AND LARVA OF THE OCELLATED SPHINX.

Sphinx Ocellata.—BRITAIN.

cated much pride in the creature, as he had never seen other larvæ hold their heads so high.

Linnæus divides this genus into the following sections:—

A. With the antennæ scaly; the feelers hairy; and the tongue spiral.

Plate 61, lower figure, represents the larva of the Ocellated Sphinx, a species of this section; and the upper figure, the pupa of the same insect.

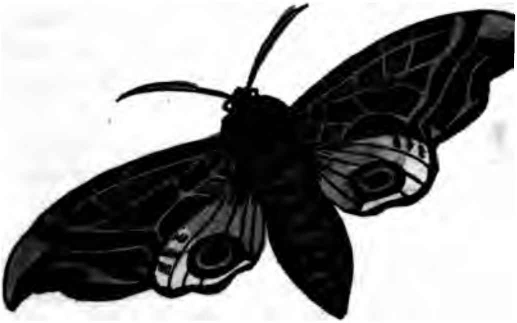
B. Sesiæ.—The antennæ are cylindrical; the tongue is exserted and truncate; and the wings entire.

C. Zygænæ.—The antennæ are thicker in the middle; and the tongue exserted and setaceous.

The species of this genus are far less numerous than those of the *Papilio* and the *Phalæna;* on that account we have been more limited in the representations. There is, besides, little striking in their history or peculiarities, except in a few of the individuals, namely,—those of the Ocellated Sphinx, the Destructive Sphinx, and the Death's Head.

The larvæ of many of the sphinges are exceedingly destructive to trees and shrubs, penetrating into hem, and often causing their total decay. Mr oseph Hayward remarks on this subject, "Having een balked in my endeavours to raise and train me young currant bushes in a particular manner, m their failing to grow so luxuriantly as I had *son to expect,* from the pains I had taken to prepare the soil, &c., I was led to a narrow examination of their exterior in search of the cause; and perceiving some wounds in the branches, that had much the appearance of being made by the entrance of small shot, I cut off a branch, when I found that the medulla, or pith, was destroyed, and its place converted into a commodious apartment and passage for some insects. I traced it for several inches, and found it occupied by a grub, or maggot; and knowing this must be the larvæ of some fly or moth, I determined on securing a few of them at the proper season, to see the result of their transformations. Having obtained some in a chrysalis state, I placed them under a glass, when, after some weeks, one of them produced a beautiful specimen of the *Ægeria tipuliformis.*"

A few only of the sphinges are remarkable for the gayety and splendour of their colours, which render the butterfly tribe so pleasing and interesting to general observers. There is, however, to counterbalance this, a peculiar grace and elegance of form throughout the whole of the sphinges, which at once distinguish them from the moths. The sphinges of Britain are not numerous, being, as is the case in other regions of the globe, a very limited genus when compared with the butterflies and moths.



62.

THE OCELLATED SPHINX.

Sphinx Ocellata.—BRITAIN.

THE OCELLATED SPHINX.

Sphinx Ocellata.—BRITAIN.

PLATE LXII.

Sphinx Ocellata, *Linn. Syst. Nat.* ii. p. 796.—*Donovan's Brit. Ins.* viii. pl. 269.—*Harris' Aurelian*, pl. 5, fig. G. H.—*Albin*, pl. 8, fig. 2.

As an example of its genus, the Ocellated Sphinx is probably one of the most elegant which is produced in Great Britain. The upper wings and body are of a beautiful reddish brown; the lower wings, at their insertion, are of a deep carmine, gradually softening off till it becomes of a pale rose colour, terminating in a citron yellow at their bases. Towards the margin on each wing is a large circular spot, like an eye, black in the centre, surrounded with a ring of deep ultramarine blue, quite iridescent, changing to the most beautiful pale cobalt blue, and the whole surrounded by a black fillet. The caterpillar is of a willow-green colour, and generally feeds on willows. It arrives at its full size towards the beginning of August, when it buries itself in the earth, and changes into a chrysalis of a bistre colour. About the first week in June following it emerges, in the form of the perfect sphinx.

The alteration of form during the different periods of life which the insects of the papilionaceous tribe undergo, affords a subject of the most pleasing contemplation to the mind of the naturalist. Though a deeply philosophical survey demonstrates that there is no real or absolute change produced in the identity of the creature itself, but that it is in reality only the gradual and progressive evolution of parts before concealed, which lay in embryo, masked under the form of an insect of a widely different appearance, yet it is justly viewed with the highest admiration, and even generally acknowledged to be in the most lively manner typical of the last eventful change of humanity.

If any regard is to be paid to a similarity of names, it would seem that the ancients were sufficiently struck with the transformations of the butterfly, and its revival from a seeming temporary death, and considered it as an emblem of the soul, the Greek word ψυχη (Psyche) signifying the soul, and also a butterfly.

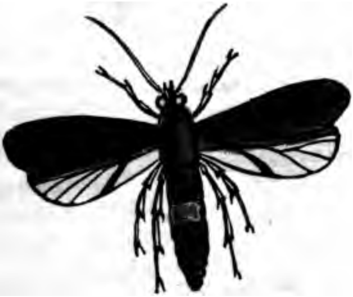
Modern naturalists, impressed with the same idea, have drawn their allusions to the resurrection of the body, from the dormant condition of papilionaceous insects, during their state of chrysalis, and their resuscitation from it; but they have, unfortunately, chosen a species the least proper for the purpose, namely the silkworm,—a species which neither *undergoes* its change under the surface of the earth, *nor, when* emerged from its tomb, is it an insect of remarkable beauty; but the larva, or caterpillar, of the Sphinx, when satiated with the food allotted to it by nature, retires to a very considerable depth beneath the surface of the ground, where it divests itself of all appearance of its former state, and continues buried for several months; then works its way to the surface, bursts from the confinement of its tomb, and commences a being of powers so comparatively exalted, and of beauty so superior, as to be one of the most elegant of the whole insect tribe, disporting, in its splendid attire, through the atmosphere.

Even the animated illustration of the resurrection, taken from the vegetable world, so justly admired, must yield, in the force of its similitude, to that drawn from insect life, since Nature exhibits few phenomena that can equal so wonderful a transformation.

This extraordinary metamorphosis is thus described by an anonymous poet; which we suppose to be Dr Shaw.

The helpless crawling caterpillar trace,
From the first period of his reptile race:
Clothed in dishonour on the leafy spray,
Unseen, he wears his silent hours away;
Till satiate grown of all that life supplies,
Self-taught, the voluntary martyr dies.
Deep under earth his darkling course he bends,
And to the tomb a willing guest descends;

There, long secluded in his lonely cell,
Forgets the sun, and bids the world farewell.
O'er the wide waste the wintry tempests reign,
And driving snows usurp the frozen plain:
In vain the tempest beats, the whirlwind blows,
No storms can violate his grave's repose;
But, when revolving months have won their way,
When smile the woods, and when the zephyrs play,
When laughs the vivid world in summer's bloom,
He bursts, and flies triumphant from the tomb!
And, while his new-born beauties he displays,
With conscious joy his alter'd form surveys.
Mark, while he moves amid the sunny beam,
O'er his soft wings the varying lustre gleam.
Lanch'd into air, on purple plumes he soars,
Gay Nature's face with wanton glance explores;
Proud of his various beauties, wings his way,
And spoils the fairest flowers, himself more fair than th
And deems weak Man the future promise vain,
When worms can die, and glorious rise again.



63.

THE DESTRUCTIVE SPHINX.

Sphinx Exitiosa.—AMERICA.

THE DESTRUCTIVE SPHINX.

Sphinx Exitiosa.—UNITED STATES.

PLATE LXIII.

Ægeria Exitiosa, *Say.—Journal of the Academy of Natural Sciences*, vol. iii. p. 216, *New.—Say*, *American Entomology*, vol. ii. pl. 19; upper and middle figures.

MALE.—The body is steel-blue; antennæ ciliated on the inner side, black, with a tinge of blue; palpi beneath yellow; head with a band at its base; both above and beneath pale yellow; eyes black-brown; the thorax with two pale yellow longitudinal lines, and a transverse one behind, interrupted above, and a spot of the same colour beneath the origin of the wings; the wings are hyaline; nervures and margin steel-blue, which is more dilated on the costal margin, and on the anastomosing band of the superior wings; the feet are steel-blue; the coxæ two bands on the tibiæ, including the spines, incisures of the posterior tarsi, and anterior tarsi behind, pale yellow; the abdomen, with two very narrow pale yellow bands, one of which is near the base, and the other on the middle; the tail is fringed, the fringe margined with white on each side.

FEMALE.—The body is very dark steel-blue, with a tinge of purple; the antennæ destitute of ciliæ the palpi are black beneath; the thorax is immaculate; the superior wings are steel-blue, witho any hyaline spot: the inferior wings are hyalin with an opaque margin, and longitudinal line of t latter colour; the tergum, with the fifth segmen bright reddish fulvous.

The Pupa has two semifasciæ of spines upo each of the segments, excepting the three termin ones, which have a single row only.

The Follicle is brown, oblong-oval, compose of small pieces of bark and earth, closely connecte together by the web of the animal.

This insect has been for years the cause of gre solicitude and regret to all the lovers of fine fruit America. Small as this creature is, measuring onl half an inch in length, it is the silent, insidious destroyer of the peach-tree.

The sexes are so remarkably different from eac other, that it was with much diffidence Mr Sa yielded his assent to their specific unity, and th was from a knowledge of the circumstance that t sexes of many of the species are very unlike eac other. In this instance, the difference is so great to render it difficult to construct a good commo specific character.

It was to Mr James Worth, a zealous and careful observer, that Mr Say was indebted for t principal part of the accurate information which possessed of this sphinx. The following observations are extracted from a valuable essay by that gentleman, published in the third volume of the *American Transactions.*

The egg, deposited on the side of a glass tumbler, was oblong-oval, dull yellow, and so small as to be only just discernible by the naked eye. Excepting in a state of confinement, he never saw the female at rest but in one instance, when she was perched on a leaf, which may possibly be the usual place of deposit, though he is inclined to believe that it is made on some part of the trunk of the tree. The larva is white, with a reddish brown head. It is somewhat difficult to ascertain the early movements of the larva, in consequence of its small size; but its destructive career certainly commences about the end of September, or beginning of October, by its entering the tree, probably through the tender bark under the surface of the soil; after having passed through the bark, it proceeds downwards into the root, and finally turns its course towards the surface, where it arrives about the commencement of the succeeding July.

Having attained to its full growth, the larva enters the pupa state between the first and middle of July; enveloped in its follicle, it may then be readily discovered close to the trunk, surrounded by the gum which oozes from the wound. The following is a *figure of*

THE FOLLICLE.

EXUVIA OF THE PUPA.

The pupa state continues from the tenth to the latter end of that month, or begi August.

Mr Worth examined his fruit-trees on the July, when he obtained twenty follicles, an thirty larvæ; of the follicles, four were em insect having assumed the winged state. T had all arrived near the surface of the ground purpose of undergoing their great change.

Against the depredations of this insect supposed remedies have been prescribed,— the application of hot water, tanner's bark, an of sulphur, to the root of the tree, and soft s lime-wash to the trunk; but it is obvious, application of this kind can injure the insect coming in contact with it, whilst it remain egg, or infantile state, on the outside of the t after having penetrated to the interior, no su *application* can affect it. The various sul *placed* around the root of the tree, such and sand, the uncovering of its base during winter, covering again for the summer, are also pronounced by Mr Worth, from his experience, to be inefficient, and even injurious to the health of the tree.

THE SPURGE SPHINX.

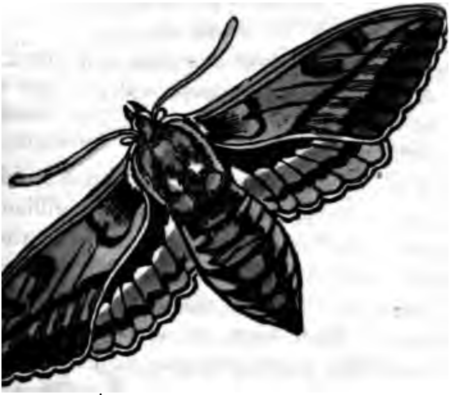
Sphinx Euphorbiæ.—EUROPE.

PLATE LXIV.

Sphinx Euphorbiæ, *Linn. Syst. Nat.* ii. p. 802.—*Sha* *Nat. Miscellany*, pl. 922.—*Drury's Ins. Exot.* i. pl. fig. 3.—*Reaumur's Ins.* i. pl. 13. fig. 1, 4, 5, 6.—*Turto* *Linné*, iii. p. 173.—*Donovan's Brit. Ins.* iii. pl. 91, 9

THE superior, or upper wings, are of a rich fa colour, with the anterior margins of a brilliant lee green, and a large cloud of the same colour towa their insertion into the body, and two semilun spots nearer the tips of the wings; there is a dou articulate black band, with a leek-green cen towards their posterior margins, bounded by a bor of brownish purple; the under wings have a b bar at their insertion, bounded by a band of crimson, below which is a band of black, and a b of pale chestnut; the anterior and posterior m of both upper and under wings are white, fimb at their edges. The body is thick, of a ric green; the whole, from the head downwards with pale chestnut; and two spots of the sam back, above which are two white spots. The white, and the antennæ chestnut, and club

The Spurge Sphinx, considered as a *Britain, is,* without exception, the rarest *the genus.*



64.

THE SPURGE SPHINX.

Sphinx Euphorbiæ.—GERMANY.

Drury has figured this sphinx, without its changes, among his rare insects, but as a native of a foreign country; and before the time of Harris, it was often an object of discussion among collectors, whether it had ever been taken in England. Harris says, "It has long been in dispute, whether the Spotted Elephant was a native of this island; but it is now past a doubt, as I had the good fortune to find a caterpillar of this moth in marshy ground at Barnscray, near Crayford, in Kent, about the middle of August. It was better than three inches long, of a dark brown colour; the horn at the tail part, which was about half an inch long, appeared black and glossy. The head was nearly the size of a small pea, and of a lightish yellow brown, or tan colour. I tried various herbs to bring it to feed, but my attempts were fruitless, and it died for want." He mentions that the chrysalis, in the plate which he figured, was sent to him from Belisle, in France; and the moth was transformed from it in the beginning of June.

The Spurge Sphinx is common in many parts of Germany, France, and the Netherlands. It is figured of the natural size in the annexed plate. The caterpillar feeds on the smaller, or European, species of the genus *Euphorbia*. It changes to a chrysalis in the month of August, from which, in the following June, emerges the perfect insect, in its imago condition; in which state it has few equals *in point of colour.*

Chipping Norton about 1824 and Bampton August 1858 & very numerous in 1865. E. G. R.

THE HUMMING-BIRD SPHINX.

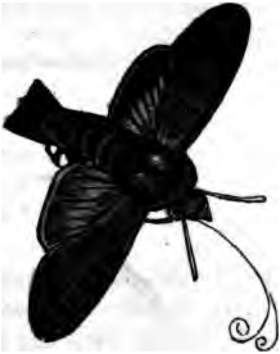
Sphinx Stellatarum.—Britain.

PLATE LXV.

Sphinx Stellatarum, *Linn. Syst. Nat.* ii. p. 803.—*T*
Linné, iii. p. 179.—*Donovan's Brit. Ins.* v. p.
Cramer, *Insects*, pl. 94, c.—*Shaw's Nat. Misc*
pl. 872.

The superior wings of this beautiful little
are of a deep brown, with two waved sesquial
bands, and a dimidiate band and black sp
each; the under wings are of a greenish yell
some individuals, and of a rich orange in o
the thorax is large, round, and capacious; an
abdomen thick, brown, and hairy beneath;
lower part of which are two white spots on eac
and a white spot on each side of the thorax, be
the head, which is sharp and pointed; the ey
large, and the antennæ club-shaped in some, a
others, they are thickest in the middle; the an
tions of the abdomen terminate with a tran
tail, not unlike that of a bird.

There are two sorts of caterpillars belongi
this species. They are alike in size and form
are very different in colour. One sort is gre



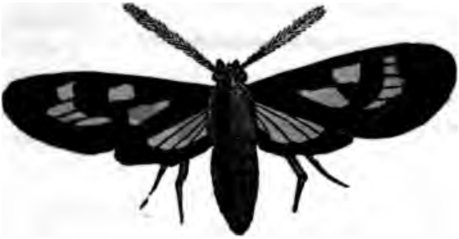
65.

THE HUMMING BIRD SPHINX.

Sphinx Stellatarum.—BRITAIN.

A variety is found in Botany Bay, and also in North America.

It may be remarked, that the *Sphinx Belis* of Linnæus and Cramer is described amongst the synonyms given by Fabricius, as a variety of *Sphinx Stellatarum*; and *Sphinx Ciculus* of Cramer differs but little from this insect, so that it may be considered the same species.



66.

THE WINDOWED SPHINX.

Sphinx Fenestrata.—Jamaica.

THE WINDOWED SPHINX.

Sphinx Fenestrata.

PLATE LXVI.

Sphinx Fenestrata, *Drury*, *Ins.* ii. pl. 28, fig. 5.—*Turton's Linné*, iii. p. 185.

The wings of this insect are of a deep brownish black, with transparent glass-like spots, three on each of the upper wings, and a larger one on each of the under wings, through which any object can be distinctly seen, from their extreme clearness. The body is thick, of a rich brown colour, the abdomen consisting of alternate black and yellow bands. The head is small, and the eyes and legs are scarlet; the thorax with three black spots on it.

This curious insect is a native of Jamaica.

THE PINE SPHINX.

Sphinx Pinastri.

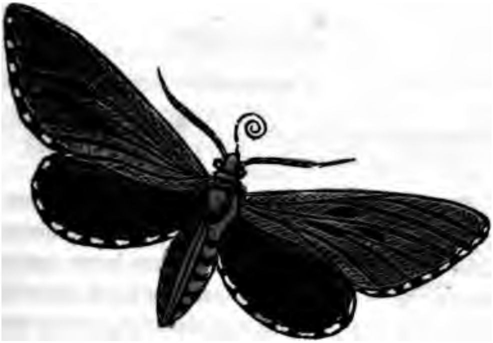
PLATE LXVII.

Sphinx Pinastri, *Linn. Syst. Nat.* ii. p. 802.—*Turton*
Linné iii. p. 172.—*Donovan's Brit. Ins.* ix. pl. 296.

THE superior wings of the Sphinx Pinastri are
a pale greenish purple, with three black spots towar
their centre; the under wings are burnt umbe
brown; all of them have a border of black and whi
spots; the head, thorax, and abdomen, are the sam
colour as the upper wings, banded with browni
black.

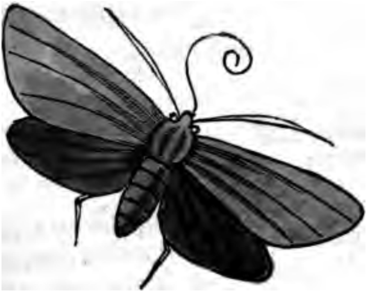
The caterpillar has an orange yellow head;
body is covered with alternate longitudinal stri
of deep green and yellow; along the centre of
back it is white, in the middle of which exte
from the head to the tail, a catenated line of rich
dish brown; and the tail is furnished with a s

The pupa is of a deep reddish brown. We
placed it as a British insect, from a traditi
report that it has been found in Scotland, n
Edinburgh, and it is said also to have been
in Sussex. It is a very plentiful species in Ger
among the extensive pine forests which ir
that country.



67.

THE PINE SPHINX.
Sphinx Pinastri.—BRITAIN.



68.

THE FORESTER SPHINX.

Sphinx Statices.—BRITAIN.

THE FORESTER SPHINX.

Sphinx Statices.

PLATE LXVIII.

Sphinx Statices, *Linn. Syst. Nat.* ii. p. 808.—*Donovan's Brit. Ins.* vi. pl. 204, fig. 2.—*Turton's Linné*, iii. p. 191.

This very beautiful Sphinx has the superior wings, thorax, and abdomen of a vivid green in some species, while in others it is of a pale yellowish green; the inferior wings are purple in some, and very pale rose colour in others; they are brown underneath; the antennæ are pectinated, and club-shaped.

The larva is of a deep black, with a line of white down the back, and some lunar-shaped spots of the same colour in different parts. It feeds on docks. The moth is transformed in May, and frequents meadows. The breadth of the insect is an inch and an eighth. Our figure is nearly double the size of nature. The chrysalis is dusky.

This sphinx is not common; it frequents Kent, Surrey, Hertfordshire, Essex, Middlesex, Yorkshire, Cambridgeshire, and Northumberland.

THE BLOODY-TAILED SPHINX.

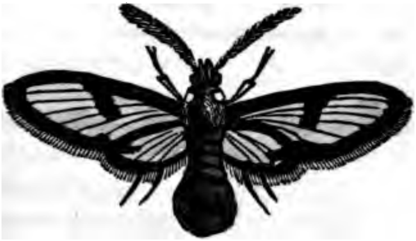
Sphinx Hæmorrhoidalis.

PLATE LXIX.

Sphinx Hæmorrhoidalis, *Turton's Linné*, iii. p. 181.—*Cramer*, v. pl. 52, c. d.

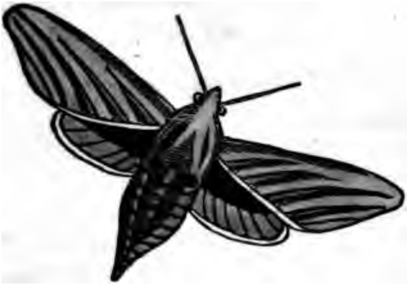
The wings are hyaline, with a broad black ban all round, and a dimidiate black band on the uppe wings; the posterior and anal margins are fimbriated; the head is small; the antennæ long an fringed; the eyes are crimson; body thick, terminated with a large rounded tail, thickly covere with fine crimson hairs; back prominent, with white circular spot on each shoulder, and a girdl of crimson below the back, the thorax with a whit spot on each side, and the abdomen red at eac end.

The Bloody-Tailed Sphinx is an inhabitant o India, and is to be found in various islands of th Indian Ocean. The figure is the size of nature.



69.

THE BLOODY TAILED SPHINX.
Sphinx Hæmorrhoidalis.—SURINAM.



70.

THE ELEPHANT SPHINX.
Sphinx Elpenor.—BRITAIN.

THE ELEPHANT SPHINX.

Sphinx Elpenor.

PLATE LXX.

Sphinx Elpenor, *Linn. Syst. Nat.* ii. p. 801.—*Turton's Linné*, iii. p. 175.—*Donovan's Brit. Ins.* iv. pl. 122.—*Harris's Aurel.* pl. 7, fig. G. H.

THE wings of this beautiful Sphinx are two inches one-sixth, to two-thirds of an inch, angular; the upper ones striped with rich fawn colour and pink; the lower wings are rose coloured, with a large black patch at their insertion; the thorax is fawn coloured, and the abdomen rose coloured, with two black spots on the upper segment.

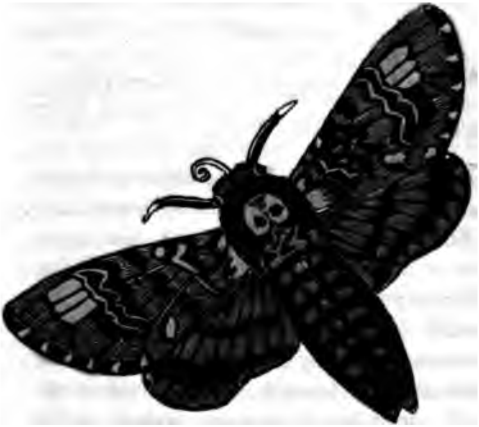
The caterpillars of this very elegant Sphinx are generally found in marshy places in June and July. They feed on the convolvulus, vine, and some other plants, but prefer white ladies' bedstraw; they cast their skin several times; and, when full fed, some are green, and others of a brown colour. The caterpillars of the female are a fine green, elegantly marked with black; those of the male are varied with the same dark markings, but the colour is a dull brown, inclining to black in those parts where *the female is green.*

It possesses a faculty peculiar to very few insects—it can protrude its head and three first joints to a tapering point; or entirely conceal the head, and contract the first joints, by drawing them apparently into the body.

The caterpillars form a white web among the leaves in August, and continue in the pupa state during the winter, when it is yellow. The chrysalis is anteriorly dull gray, and posteriorly brown, with the spiracles obscure. The Sphinx emerges in the following May. They are very subject to attacks from the Ichneumon Fly, to which they frequently fall a sacrifice.

This Sphinx is not uncommon near London, Hertfordshire, Surrey, Devonshire, Shropshire, Cambridgeshire, Yorkshire, and Northumberland.

It is the *Deilephila Elpenor* of Ochsenheimer; and is subject to considerable variety in the depth of its colours.



71.

THE DEATH'S HEAD SPHINX.

Sphinx Atropos.—BRITAIN.

THE DEATH'S HEAD SPHINX.

Sphinx Atropos.

PLATE LXXI.

Sphinx Atropos, *Linn. Syst. Nat.* ii. p. 799.—*Donovan's Brit. Ins.* ix. pl. 289; Pupa and Larva, pl. 290—*Turton's Linné*, iii. p. 172.

The Death's Head Sphinx is the largest and most remarkable of its genus, if not the most beautiful of all the European insects of its kind. The upper wings are of a fine dark gray colour, with a few variegations of yellow-orange, and sometimes, though rarely, white clouds; the under wings are of a bright orange colour, marked by a pair of transverse black bars, while, along the top of the back, from the thorax to the tail, runs a broad, blue-gray stripe; on the top of the thorax is a very large patch of a most singular appearance, exactly resembling the usual figure of a skull or death's head, and is of a pale gray, varied with dull ochre colour and black.

When in the least disturbed or irritated, this insect emits a stridulous sound, something like the squeaking of a bat or a mouse; and from this circumstance, as well as from the mark above mentioned on the thorax, is held in much dread by the vulgar in several parts of Europe, its appearance being regarded as an *ill omen, or harbinger* of approaching fate.

The celebrated Reaumur informs us, that the members of a female convent in France were thrown into great consternation at the appearance of one of these insects, which happened to fly in during the evening at one of the windows of the dormitory.

"The caterpillar from which this curious Sphinx proceeds is in the highest degree beautiful, and far surpasses in size every other European insect of the kind, measuring sometimes near five inches in length, and being of a very considerable thickness: its colour is bright yellow, and the sides marked by a row of seven most elegant broad stripes, or bands, of a vivid violet and sky-blue colour; the tops of these bands meet on the back in so many angles, and are varied on that part with jet black specks; on the last joint of the body is a horn, or process, not in an erect position, but hanging or curving over the joint in the manner of a tail, having a rough or muricated surface, and of a yellow colour. This caterpillar is principally found on the potato and jessamine, those plants being its favourite food. It usually changes into a chrysalis in the month of September, retiring for that purpose pretty deep under the surface of the earth, the complete insect emerging in the following June or July; but some individuals are observed to change into a chrysalis in July or August; and these produce the complete insect in November; so that *there* appear to be two broods or annual races."

The Death's Head Sphinx is generally considered as a very rare insect; and, as the caterpillar feeds chiefly by night, concealing itself during the day under leaves, &c., it is not often detected; yet, from some singular circumstances favourable to its breed, there are some seasons in which it is even plentiful. Dr Shaw tells us, that in the autumn of 1804, the caterpillar was so common in some countries as to be very prejudicial to the potato plants, particularly in some parts of Cornwall and Surrey.

This animal is a great enemy to bees; and on this interesting point I shall quote what Mr Huber states, in a chapter entitled, "On a New Enemy of Bees." "Among the labours of insects," says he, "those which concern the defence of their habitations are not the least deserving the attention of man, who is so often called on to fortify himself against the enterprises of his enemies. It is here that Nature unfolds the most unexpected resources, where she admits of the greatest latitude; for the chances of war are the object of one of those general laws concurring to the preservation of universal order. Without the alternatives of success and reverse, how could an equilibrium be maintained? One species, endowed with superior strength, would annihilate another. Nevertheless, the most timid have subsisted since the origin of things; their tactics, their industry, and their fecundity, or other circumstances peculiar to their kind, have enabled them to *escape that extinction* which seems to menace them.

"Among bees, as with the greater part of their class, the ordinary means of resistance are those poisoned weapons with which they wound their enemies. The fate of war would be more in their favour, were not several of their antagonists armed still better than themselves,—if others had not the art of shunning their vigilance by sheltering themselves under a covering,—and were there not also some which can profit, by the weakness of an ill-peopled hive, to gain a surreptitious introduction into it.

"Wasps, hornets, the larvæ of moths, and mice, have been known from all antiquity by their ravages among hives; and having nothing to add to what is generally said respecting them, I shall confine myself to pointing out a new enemy of bees.

"Towards the close of summer, after having stored up part of their collections, we sometimes hear a surprising noise in their habitations. A multitude of workers depart through the night, and lose themselves in the air; the tumult frequently continues during several hours, and on examining into the consequences of so great an agitation in the morning, we find numbers dead before the hive. For the most part, the honey is observed to be exhausted, and occasionally the hive is quite deserted.

"In the year 1804, many of my neighbouring *cultivators* came to consult me on an occurrence of *this* nature. But I could give them no explanations; notwithstanding my long practice in studying bees, I never had seen any thing similar.

"On visiting the scene, I found the phenomenon still subsisting, and that it had been very accurately described; but it was assigned to the introduction of bats into the hives, which I had difficulty in crediting. These creatures are satisfied with seizing nocturnal insects in their flight, which are never wanting in summer. They do not feed on honey; why, therefore, should they attack bees in their habitations, for the purpose of pillaging their stores?

"However, it might be some other animal: therefore, having put my people in ambush, they soon brought me intelligence, not of bats, indeed, but of the Sphinx Atropos, or Death's Head, a large moth flying in numbers about the hives; and one was caught at the moment of attempting to penetrate a hive among the least populous, where it evidently designed living at the expense of the bees.

"From all quarters I had information of similar ravages committed by bats, as supposed. Cultivators who expected a plentiful harvest, found their hives as light as in the first days of spring; though recently well provisioned, they were now reduced to the weight of wax.

"At length, the gigantic moth which had occasioned the desertion of the bees, was surprised in several hives.

"*Such reiterated* proofs were requisite to persuade me that a butterfly, an insect wanting a sting, unprovided with any shield or other means of defence, could contend victoriously against thousands of bees; but this year they were so common, that it was easy to be convinced of the fact.

" As the enterprises of the Sphinx constantly became more fatal to the bees, we resolved to prevent its access, by contracting the entrance of the hive by a kind of grating large enough to admit none but its proper tenants. This plan had complete success, quiet was restored, and the devastation ceased.

" The same precautions had not been universally taken; but we observed that the bees, left to themselves, had provided for their own security. Without any foreign aid, they had barricaded themselves, by means of a thick wall of propolis and wax, rising behind the entrance of the hive, sometimes in the entrance itself, and completely obstructing it, but penetrated by passages for one or two workers at a time.

" The operations of man and of the insect had completely coincided.

" The works which the bees had established were of very various formation. Here was a single wall, whose opening arcades were disposed in its higher part; there several bulwarks behind each other recalled the bastions of our citadels.. Gateways, masked by walls in front, opened on the face of hose of the second row, while they did not correpond with the apertures of the first. Sometimes series of intersecting arcades permitted free egress o the bees, but refused admittance to their enemies. These fortifications were massy; their substance firm nd compact.

" As such casemated gates are not constructed y bees without urgent necessity, we cannot ascribe heir proceedings to any of those demonstrations of rudence prepared to obviate inconveniences, which he insect neither can know nor anticipate. It is nly when danger is present, when it is pressing and mmediate, that, compelled to seek protection, it mploys this last resource. Thus it is curious to bserve an insect, so well armed and supported by he advantage of numbers, securing itself by an dmirable combination against the inefficiency of its weapons and its courage. The art of warfare among ees, therefore, is not restricted to attacking their nemies; they know also to construct ramparts, as helter from their enterprises; from the part of imple soldiers, they pass to that of engineers.

" But it is not against the Sphinx alone that they ust be guarded. Weak hives are sometimes atcked by stranger bees, attracted by the odour of e honey, and the hopes of easy pillage. Those eset, being unable to defend themselves from this vasion, are known to have recourse to a measure *sembling that* employed against the hostile moth.

Then, also, they raise walls, leaving only narrow openings for the passage of a single bee at a time, and which, therefore, can be easily protected.

"But a period arrives when these galleries are no longer suitable to the bees. At the time that their harvest is abundant, their hive excessively populous, and the formation of new colonies approaches, they demolish the gateways which had been erected in the hour of danger, and which now restrain their impetuosity. Such safeguards have become inconvenient, and they are removed, until new alarms demand their reconstruction.

"The entrances formed in 1804, were destroyed in spring 1805. The Sphinx did not appear that year, nor was it seen in the year following; but it returned in great numbers in autumn 1807. By speedily barricading themselves, the bees prevented their threatened ravages; but before the departure swarms, in May 1808, they demolished the fortifications, whose narrow passages prohibited free egress to the multitude.

"When the entrance to the hive is itself restricted, on care being taken to contract it soon enough to prevent the devastation of their enemies, bees dispense with walling themselves in. We cannot explain their conduct otherwise, than by admitting the evolution of their instinct according as excited *by circumstances*.

"*But* how can the Sphinx alarm colonies so warlike? How can a moth, the dread of superstitious people, also exercise a secret influence over insects, and have the faculty of paralyzing their courage? Does it emit any emanation pernicious to bees?

" Other species of sphinges subsist on the nectar of flowers alone; they have a long, slender, flexible, spiral trunk, and seek their food at sunset. But the Atropos is later on the wing; nor does it hover about the hives until night is far advanced. It is provided with a thick, short proboscis; is endowed with great strength; and when seized, some unknown organ emits an acute stridulous sound. May not this, which inspires the vulgar with sinister ideas, be also the dread of bees? May not its resemblance to that emitted by the queen in her captivity, which has the faculty of suspending the vigilance of the workers, explain the disorder observed in their hive on the approach of the Sphinx? But this is only a conjecture, founded on the analogy of sounds, to which I attach no importance. Meantime, were any piercing notes observed to proceed from the Sphinx during its assaults, and that the bees then yielded without resistance, my conjecture would acquire some weight.*

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* " Reaumur ascribes the sound to the friction of the trunk against its sheaths, but we have ascertained that this organ has no share in it. Though many naturalists have investigated its *source, nothing* satisfactory is known on the subject. It is un-

" The introduction of a butterfly so large and recognizable as the Sphinx Atropos into a well-peopled hive, and the extraordinary consequences thence resulting, are phenomena of the more difficult explanation, from nothing in the organization of the insect indicating that it is screened from the sting of bees.

" We have been anxious to witness this singular contest in glass hives, but no opportunity has hitherto offered. However, to solve some of my doubts, I have made a few experiments on the mode in which the Sphinx is received by humble bees.

" Having procured some of the largest size, I introduced them at nightfall into a glass box, where a colony of small brown humble bees (*Muscorum*) had been established. The first carried thither did not appear to be affected by the smell of the honey; it remained quiet in a corner. Beginning to approach the nest and its inhabitants, it soon became the object, not of the dread, but of the wrath of the workers. Repeatedly assailing it with fury, they gave it frequent stings; it sought to escape; it ran quickly; and, at last, raising the glass cover of the apparatus by a violent exertion, succeeded. It seemed to suffer very little from its wounds; remained tranquil all the night; and several days after was wonderfully well.

doubted that the Sphinx emits the sound at pleasure, and *particularly when affected* by the apprehension of danger.

"Another Sphinx, very vigorous and lively, which often emitted the sound peculiar to its species, was confined along with the same colony. Its activity only served to render it sooner the victim of their rage. Immediately on approaching the nest, which, nevertheless, it seemed to have no desire to enter, all the workers darted on it at once with their stings, and harassed the creature so incessantly as to compel it to retreat. The moth defended itself only by the violent agitation of its wings, but it could not evade the attacks of the humble bees under the belly, where it seemed most sensible of their weapons. At length, after an hour of suffering, it perished under many wounds.

"I was unwilling to carry this cruel experiment farther. Captivity, or some other circumstance, evidently reduced the insect to too great an inferiority to the humble bees. Yet, after the experiment, it became still more difficult for me to understand how it could introduce itself into the hives of common bees, whose stings are so much more dangerous, as well as their numbers incomparably greater. Had the light of a torch been an obstacle to the Sphinx exercising its means of attack? Possibly the success of its enterprises on hives results from the faculty of seeing during the night, like other moths of the same genus.

"*Offering* honey to these insects was equally fruitless. They remained during a week beside a comb without touching it; we unfolded the proboscis, and dipped it among honey in vain. This experiment, though succeeding perfectly with day butterflies, proved abortive with the Sphinx Atropos.

"Had I not obtained proofs of its avidity while in the natural state, I might have entertained doubts of the predilection for honey. Besides, the facts above related are supported by my having recently dissected a large Sphinx taken in the open air, and found the abdomen quite full of pure honey, of the same taste and consistence as that of the bees. The quantity would have filled a tablespoon; and what appeared very singular, was its not being contained in any particular intestine, but occupying the cavity usually reserved for air in the body of these insects. All the vertical delicate membranes dividing the abdomen into so many compartments had disappeared, I cannot affirm positively whether they had been ruptured by the quantity of honey gorging the Sphinx, or by ourselves; but one thing is undoubted, that in others of the Sphinx Atropos, opened by us, we have always seen the receptacles entire, though empty."

GENUS PHALÆNA, OR MOTHS.

ALMOST the whole tribe of Moths are nocturnal animals; and, in general, their caterpillars are very destructive creatures.

The general transformations, as described in the first volume, apply to all the lepidopterous insects; but the architecture and particular economy of Moths was reserved for the introduction to this genus.

CHAPTER I.

DIRECT INJURIES FROM MOTHS.

With respect to the direct injuries which are caused by moths to mankind, I may mention, that the hairs of several caterpillars of the genus *Phalæna* are exceedingly troublesome, producing the same effects on the human skin as the hairs which grow on the pods of the cow-hedge, (*Dolichos pruriens et urens* of Linnæus,) which occasion a disagreeable, and, to some individuals, a painful itching.* The larvæ of several of the family of moths called *Bombyx*, of which number is the Processionary Moth, have this quality. M. Reaumur has given an interesting and curious account of the effects of these, produced on himself, He had been handling some of these larvæ, the hairs of which adhered to his skin, and he suffered considerable uneasiness from them for some days. He was not aware of the cause of his disquietude; and, having also rubbed his eyes while his hands were studded with these spines, they produced such a degree of inflammation and swelling in the eyelids, that he opened them with much difficulty. Disagreeable effects were also produced in ladies who went near the nests of these caterpillars. Tumours were induced on their necks, which could only be accounted for by the short hairs, or fragments of them, being forced into their skin from standing in the direction of the wind.* The larva of the moth of the Fir (*Bombyx pityocampa* of Fabricius) produces similar effects, causing even intense pain, fever, itching, and great restlessness. This was the celebrated *Pityocampa* of the ancients, considered by the Romans as a deadly poison, as will appear from the Cornelian law, "*De sicariis*," being made to include those who administered *Pityocampa*.†

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* Messrs Kirby and Spence say, that "cow-hedge has been administered with success as an anthelminthic, as has likewise spun glass powdered, the spicula of these substances destroying the worms." The hair of the caterpillars here alluded to, *and, perhaps,* also of the larva of Bombyx *Caja*, (the Tiger *Moth,) might* probably be equally efficacious.

We are informed, in a paper in the *Philosophical Transactions*, by Dr Lister, a celebrated naturalist and physician in the reign of Queen Anne, that a boy vomited up several living caterpillars, with sixteen legs. It is easy to suppose that he must have swallowed insects' eggs, while eating some vegetable substance on which they had been deposited, and that they had undergone transformations into the larva state in his stomach. It is very common for the larvæ of beetles, &c. to be generated in the stomach, and voided alive, which can only be accounted for by swallowing them in the egg state.

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* Reaumur, *Mem. des Insectes*, ii. p. 191-5.

† *Pliny*, *Hist. Nat.* i. 38, c. 9.

Azara, a celebrated Spanish traveller, informs us, that, in South America, there is a large brown moth, which produces its eggs in a gelatinous substance upon the skins of persons who sleep naked, where they transform into the larva state; then insinuate themselves under the skin, producing swelling, inflammation, and excessive pain. These, when noticed by the native Indians, are squeezed out. They generally amount to five or six individuals.[*]

A very destructive moth is the Antler moth, *Bombyx Graminis* of Linnæus; and, although less frequently met with in this country than on the Continent, is nevertheless sometimes a most troublesome pest to our farmers. In the year 1759 and 1802, the caterpillar of this Phalæna proved a dreadful scourge to many of the higher sheep farms of Tweeddale in Scotland. In certain spots, the grass, for a mile square, was totally devoured by it.[†] In the year 1740, 1741, and 1742, in Sweden, these larvæ multiplied so prodigiously, and committed such ravages, that the fields were quite eaten up by them, and had the appearance of having been consumed by fire.[*]

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[*] Azara's *Travels*, p. 217.

[†] *Farmers' Mag.* iii. 487.

Still farther to the north, according to the account of Pallas, a moth of another species is even more troublesome and destructive than that above mentioned, extending its ravages to almost all green things. This celebrated traveller tells us, that in Kasau, a government of European Russia, lying between the 46° 20′ and 49° 40′ east longitude, and the 54° and 57° of north latitude, the larva of the *Phalœna frumentalis* not unfrequently eats the greater part of the spring corn to the root.[†]

There is a white moth, the caterpillar of which is a great nuisance to the sugar planters; it is called the Borer, and makes dreadful havoc amongst the sugar canes of many of the colonies. The Society of Arts offered a reward of fifty guineas to any one who could invent a method for their destruction; but no effectual plan has yet been devised for expelling them.

While on this subject, I may mention an insect, although of a different order, which, in the West Indies, commits still more dreadful havoc. A frightful picture of their depredations is recorded in the *Philosophical Transactions.*[‡] This is a species of ant, (the *Formica saccharivora* of Linnæus,) which does not prey upon the sugar canes, but makes its nest under the roots, and injures them so much, that they soon become unhealthy and unproductive. About eighty-five years ago, these destructive creatures were produced in the island of Granada in such inconceivable numbers, as totally to ruin the cultivation of this valuable plant. They descended from the higher grounds like mighty torrents, and swept every thing before them. Every road, and lane, and plantation, were inundated by them. Domestic quadrupeds perished in consequence of this awful pest. Even wild animals, rats, mice, and reptiles, became a prey to them; and birds, which alighted in search of food, fell victims to these marauders. Such was the determination of their advances, that streams of water offered but a momentary check to their progress. Those which formed the van fearlessly sacrificed themselves for the common good—each followed his fellow, till an embankment or dam of the drowned insects was formed, when the main body passed over in safety. Fires were lighted of dry vegetable substances, and the grass was ignited, but this formed no greater an obstacle than the water; for, even then, it was only those in front who suffered, and soon extinguished the flames, by the countless numbers of their carcases, allowing their followers to pursue their pesti*lential* march unhurt. The whole of the standing *sugar canes* were at length burnt down, and the roes set to dig up the earth in every direction, to if this would extirpate them; but vain was all thly means. The great sum of £20,000 was of- rd as a reward to any person who should discover iode of destroying them; but no plan could be ised, till, in the year 1780, the wise Disposer of things, by sending a most awful hurricane, ac- npanied by mighty torrents of rain, ridded Gra- la of this scourge, and at the same time proved st fatal and destructive to many of the other est India islands.

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[*] De Geer, ii. 341.

[†] Pallas's *Travels in South Russia*, i. 30.

[‡] *Vol.* xxx. p. 346.

In a tour through the West Indies by M'Kinnen,* states, that, in the years 1788 and 1794, two- rds of the cotton crop were destroyed by a cater- lar called the *Chenille*, which is supposed to be larva of a moth.

Let us turn to our gardens, and see what ravages often committed by the larvæ of these beautiful mals. The bowers of Pomona are frequently laid ste by them. The Currant Moth (*Phalæna gros- ariata*) frequently destroys whole gardens of this it. Lettuces are subject to the attacks of various cies of moths, such as the beautiful one called the er, (*Bombyx cajas* of Fabricius,) and the cater- ar of an anonymous one, which is described by umur as commencing at the root, eats itself a micile in the stem, and their lodges; which so completely destroys the plant, that it never cabbages.* The Pot-herb Moth (*Noctua olevacea* of Fabricius) is no less consuming to this and other esculent vegetables. Besides the *Papilio brassica*, cabbages are infested with a moth which is equally destructive, called by Fabricius the *Noctua brassica*, which does not confine its depredations to the leaves, but penetrates to the very core of the plant, thereby causing its total demolition.

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* Page 171.

By a wise provision in nature, many of these caterpillars are limited to become the destroyers of specific plants; but there are others whose depredations are universal, laying waste the whole produce of our gardens. The Gamma Moth (*Noctua gamma*)—so named from having a character represented in gold on its primary wings, exactly corresponding with that Greek letter—may be numbered among these. In different countries, at certain seasons of the year, this larva commences its work of devastation, and holds up a strong proof of the power of Providence in working great ends by simple means. This insect, though a common inhabitant of Britain, has seldom been known to commit much mischief with us. In other countries of Europe it is far otherwise; for, in the year 1735, it propagated to such an alarming degree, that it overspread nearly the whole of France. Every road was filled with them, tra-

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* Reaumur, ii. 471. De Geer, ii. 440.

ling from one field to another. In the kitchen-
dens their work of devastation was complete, for
y left nothing of the whole tribe of culinary vege-
les but the stalks and veins of the leaves. The
orant populace, conceiving that these pests were
isonous, and even affirming that fatal effects had
lowed the eating of them, felt such a consterna-
n, that even in Paris, for many weeks, not an
dividual would use pot-herbs in their soups. It
as fortunate, however, for France, that these de-
oilers did not extend their ravages to the corn
lds, otherwise a famine would have been the con-
quence.

It has been satisfactorily proved by M. Reaumur,
at so prolific are these insects, that a single pair of
em might produce, in the course of one season,
ghty thousand individuals. How soon, then, might
ey overspread the world, and devour the entire
its of the earth, did not the benign Creator of all
ings see fit to check their progress by a wise pro-
sion! The Ichneumon Fly, by depositing its eggs
ithin the body of the caterpillar, become larvæ, and
ey upon its vitals; and by this means the number,
hich would otherwise be overwhelming, is kept
ithin due bounds.

Caterpillars are great enemies to all kinds of fruit;
d the foliage suffers much from the depredations
the larva of the Black and White Caterpillar of the
halæna grossulariata. Mr Forsyth, in his work on

fruit-trees, says that a little moth is very injurious to the pear-tree.* There is a moth which Linnæus calls the pest of Pomona, and the destroyer of the blossoms of the apple, pear, and cherry. Certainly this most useful fruit is subject to great havoc from the caterpillar of the Figure-of-Eight Moth, (*Bombyx cœrulocephala* of Fabricius,) an insect common to Europe.

In the years 1731 and 1732, a general alarm was caused in France by the appearance of vast numbers of the larva of a moth nearly allied to the Brown-tailed Moth, (*Bombyx phæorhœa* of Fabricius.) Oaks, elms, and white-thorn hedges, appeared as if blighted by lightning, for their leaves were totally withered, and dyed of a reddish brown colour; the caterpillar feeds on one surface of them only, and that which is left soon becomes seared and brown. Their attacks did not end with the trees of the forest, for they penetrated into the orchards, stript them of their foliage, and afterwards preyed upon the fruit. So universal was this scourge, that it spread general consternation, and at length an edict was issued by the Parliament, ordaining people to collect and destroy them. But even this means had nearly proved abortive, when, fortunately, a tract of cold weather set in, accompanied by heavy rains, which so completely extirpated them, that it was with culty that even a single larva could be met h.*

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* Page 271.

The Brown-tail Moth has made a conspicuous re in history, from the great alarm its caterpillar sed to the inhabitants of the vicinity of London he year 1782. These were so multitudinous, and ir devastation was so complete, that rewards were red for collecting the caterpillars, and the church-rden and overseers of parishes were appointed to them burnt. The peasantry and others flocked with bushels of them from all directions, for the e of the premium.

In the year 1731, the caterpillar of the *Bombyx par* committed terrible havoc among the oaks of ance; and in 1797, the larva of the *Bombyx echa* of Fabricius sadly devastated many of the ensive forests in the vicinity of Bareuth, in varia.† And De Geer informs us that the *Noctua mata* of Fabricius is a dreadful enemy to all st-trees. In various provinces of North America, woods are entirely stript of their foliage by a cies of caterpillar of the moth tribe. This usually ppens during the warm season, and often proves l to the forest, as the trees, being denuded of ir leaves, are totally dried up, and die.‡

These are among the enemies which make an open attack upon the vegetable kingdom, but there are many others which carry on their work of destruction in concealment; among which may be numbered the larva of the *Bombyx cossus,* which insinuates itself into the heart of the willow and sallow, and feeds upon the wood, which it frequently devours so effectually, that large trees are often blown down in consequence of being quite hollow at heart.

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* Reaumur, ii. 122.

† Wiener, *Verzeich.* 8vo edition, p. 55.

‡ *Kalm's Travels*, ii. 7.

There are other animals of a more insignificant nature, which are enemies to the comforts of man. Reaumur tells us of a little moth, whose larva feeds upon chocolate, and naturally concludes that this could not have been its original food. Leuwenhoek detected a moth which preyed upon two spices, the mace and the nutmeg.

Even the clothes which we wear, the blankets which cover us at night, and the furs which decorate and add comfort to the fair sex, are not free from these pests. Notwithstanding the utmost care of the housewife in preserving every thing made of wool from the attacks of moths, it too often proves abortive; for these depredators insinuate themselves no one knows how, and they are too frequently left unnoticed till they have completed their work of destruction. Linnæus describes five species of these,—the *Tinea vestinella, tapetzella, pellionella, sarcitella,* and *mellonella.* Of the first of these we have no particular *history,* only that it destroys clothes during summer; but of the others, Reaumur has given a very com-count. The Tapestry Moth (*Tinea tapet-* s very common in our houses, and very ive to the furniture of carriages, which is more exposed to the air than the furniture partments. They do not construct a move- bitation like the common species, but, gnaw- r way in the thickness of the cloth, weave ves silken galleries, in which they domicile, ich they render snug and warm, by covering ith some of the eroded wool.* The Skin Moth *pellionella*) is the dread of ladies in all parts orld, who have too often occasion to deplore atful devastation they commit on the costly muffs, tippets, and trimmings. These hidden tors are alike the pest of the princess and the peasant of northern regions, sparing neither ine nor the bear's hide. Its proper food is it sometimes also lives on wool. If it is it will not scruple to make horse-hair its ts domicile is not unfrequently formed of se material, which it moves about from place . So perfect is the work of destruction of inute animals, that a razor could not more y remove the fur from a hide, than they the task with their mouths.† The Pack *Tinea sarcitella*,) generally feeds on wool, but has been known also to feed on fur, and even hair, when urged by necessity. To woollen clothes they frequently do much mischief, more especially in damp or ill-aired situations. It has been before noticed that the *Tinea mellonella* commits great havoc in our bee-hives. If, however, it cannot get at the wax, it will feed on woollen cloth, leather, and even paper.

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* Reaumur, iii. p. 266.

† *Ibid.* iii. p. 59.

There is a caterpillar of a little moth, whose species has not yet been named by naturalists, which feeds on damp old books, and by whose depredations many a volume of antiquity has been lost to the world. The devastation of this minute destroyer is described with much fancy in the following verses :—

THE BOOK WORM.

BY DR PARNELL.

Come hither, boy; we'll hunt to-day
The Book Worm, ravening beast of prey,
Produced by parent earth, at odds,
As fame reports it, with the gods.
Him frantic hunger wildly drives
Against a thousand authors' lives:
Through all the fields of wit he flies,
Dreadful his head with clust'ring eyes,
With horns without, and tusks within,
And scales to serve him for a skin.
Observe him nearly, lest he climb
To wound the bards of ancient time;
Or down the vale of fancy go,
To tear some modern wretch below:

On every corner fix thine eye,
Or ten to one he slips thee by.
  See where his teeth a passage eat;
We'll rouse him from the deep retreat.
But who the shelter's forced to give?
'Tis sacred Virgil, as I live!
From leaf to leaf, from song to song,
He draws the tadpole form along,
He mounts the gilded edge before,
He's up, he scuds the cover o'er;
He turns—he doubles—there he past,
And here we have him caught at last.
  Insatiate brute, whose teeth abuse
The sweetest servants of the muse!
(Nay, never offer to deny,
I took thee in the fact to fly.)
His roses nipt in every page,
My poor Anacreon mourns thy rage.
By thee my Ovid wounded lies;
By thee my Lesbia's sparrow dies;
Thy rabid teeth have half destroy'd
The work of love in Biddy Floyd;
They sent Belinda's locks away,
And spoil'd the Blouzelind of Gay.
For all, for every single deed,
Relentless justice bids thee bleed.
Then fall a victim to the Nine,
Myself the priest, my desk the shrine.
  Bring Homer, Virgil, Tasso, near,
To pile a sacred altar here:
Hold, boy, thy hand outruns thy wit;
You reach'd the plays that Dennis writ;
You reach'd me Philip's rustic strain—
Pray take your mortal bards again.

Come, bind the victim—there he lies,
And here, between his num'rous eyes,
This venerable dust I lay,
From manuscripts just swept away.
The goblet in my hand I take,
(For the libation's yet to make,)
A health to poets! all their days
May they have bread as well as praise;
Sense may they seek, and less engage
In papers fill'd with party rage.
But if their riches spoil their vein,
Ye muses, make them poor again.
Now, bring the weapon—yonder blade—
With which thy tuneful pens are made.
I strike the scales that arm thee round,
And twice and thrice I print the wound;
The sacred altar floats with red,
And now he dies, and now he 's dead.

There is hardly a thing on earth free from the attacks of moths, or other insects. Our museums, which present the finest specimens of insects, plants, animals, and birds, often fall a sacrifice to these destroyers; among which may also be ranked the *Tinea insectella.*

Ulloa mentions the maggot of a kind of moth, which is peculiar to Carthagena, and called there the *Comegen.* It is so extremely minute that it is not discernible to the naked eye. It destroys all kinds of household stuff, except solid metals. A single *night* has been sufficient for these little depredators *to destroy* the entire goods of a warehouse, reducing bales of merchandise to dust without their external appearance or shape being altered; and it is only when they are handled that the merchant perceives the wreck of his property.*

To check the superabundance of species which would, in the course of time, overrun the earth, it has been wisely ordered, that one species shall prey upon another. The destructive larvæ of the *Bombyx villica,* and that of other species of moths, become a prey to the larva of various species of the Ichneumon Fly, which deposits its egg within the body of this caterpillar, where it remains, preys upon its interior, changes to the chrysalis condition, and emerges when it has assumed the perfect or imago state. The *Colosoma sycophanta,* an animal of the Beetle kind, often takes up its station in the nests of the *Bombyx processionea,* (the Processionary Moth,) and other moths, and sometimes gluts itself so much with devouring these caterpillars, that it is nearly ready to burst.

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* ULLOA, i. 67.

CHAPTER II.

DIRECT BENEFITS FROM MOTHS.

Among the direct benefits derived from insects, it may be noticed, that the caterpillar of the Great Goat Moth, (the *Bombyx* and *Cossus*,) was fattened with flour by the luxurious Romans, and considered by them as a great delicacy.*

Mr Kirby says, "No insects are more numerous in this island than the caterpillars of Lepidoptera; if these could be used in the stock of food in times of scarcity, it might serve the double purpose of ridding us of a nuisance, and relieving the public pressure." Reaumur suggests this mode of diminishing the numbers of destructive caterpillars, speaking of that of *Noctua gamma*, which did such infinite mischief in France in the year 1735.† If, however, we take to eating caterpillars, I should, for my own part, be of the mind of the red-breasts, and eat only the naked ones.‡ But we will see that there is some encouragement from precedent to make a meal of the caterpillars which infest our cabbages and cauliflowers. Amongst the delicacies of a Boshies-man's table, Sparrman reckons those caterpillars from which butterflies proceed.* The Chinese, who waste nothing, after they have unwound the silk from the cocoons of the silkworm, send the chrysalis to table; they also eat the larva of a Sphinx,† some of which tribe, Dr Darwin tells us, are in his opinion very delicious;‡ and, lastly, the natives of New Holland eat the caterpillars of a species of moth of a singular new genus, to which Alexander M'Leay, Esq. (the colonial secretary, and an eminent naturalist,) has assigned characters, and, from the circumstance of its larva coming out only in the night to feed, has called it *Nycterobius*.

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* Pliny, *Hist. Nat.* i. xvii. c. 24.

† Reaumur, ii. 341.

‡ Ray's *Letters*, 135.

A feast of insects is ingeniously described in Herrick's *Hesperides*, in the following stanzas, as having been enjoyed by Oberon and his queen Titania.

OBERON'S FEAST.

Shapcot! to thee the fairy state
I with discretion dedicate;
Because thou prizest things that are
Curious and unfamiliar.

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* SPARRMAN, i. 201.

† SIR G. STAUNTON'S *Voyage*, iii. 246.

‡ *Phytologia*, 364.

Take first the feast—these dishes gone,
We'll see the Fairy court anon.
A little mushroome table spred,
After short prayers they set on bread,
A moon-parcht grain of purest wheat,
With some small glit'ring gritt, to eate
His choyce bitts with; then, in a trice,
They make a feast lesse great than nice.
But all this while his eye is served,
We must not thinke his eare was sterved;
But that there was in place to stir
His spleen, the chirring grashopper,
The merry cricket, puling fly,
The piping gnat for minstralsy.
And now, we must imagine, first,
The elves present, to quench his thirst,
A pure seed-pearle of infant dew,
Brought and besweetned in a blew
And pregnant violet; which done,
His kitling eyes begin to runne
Quite through the table, where he spies
The hornes of paperie butterflies,
Of which he eates, and tastes a little
Of that we call the cuckoes spittle;
A little fuz-ball pudding stands
By, yet not blessed by his hands,
That was too coorse; but then, forthwith
He ventures boldly on the pith
Of sugred rush, and eates the sagge
And well bestrutted bee's sweet bagge;
Gladding his pallat with some store
Of emits eggs—what wo'd he more?
But beards of mice, a newt's stew'd thigh,
A bloated earewig and a flie,

With the red-capt worm, that's shut
Within the concave of a nut,
Brown as his tooth. A little moth,
Late fatned in a piece of cloth;
With withred cherries, mandrakes' eares,
Moles' eyes; to these the slain stag's teares,
The unctuous dewlaps of a snaile,
The broke heart of a nightingale
Orecome in musicke.——
——————This done, commended
Grace by his priest: the feast is ended.

umur has suggested, that it is probable that
olours, of beautiful tints, might be obtained
e fæces of the larvæ of the common Clothes
which retains the colour of the wool they
aten with undiminished lustre, and mixes
with water. To get a fine yellow, blue, red,
green, or any other colour, it would only be
ry to feed the larvæ with cloth of the tint
d.*

of all the benefits to be derived from the
aceous tribes, none can equal that of silk,
hich is made the richest of dresses, for the
of almost all civilized countries, and which
lustre to courts themselves; and, whether
mate it on that account, or for the import-
its manufacture, in giving employment to
ds of individuals, it must be admitted as a

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* Reaumur, iii. 95.

singular blessing bestowed by Providence on man, by simple and natural means.

All the silk produced in Europe, and the greater proportion of that which is so extensively manufactured in China, is the produce of the common Silkworm, the larva of *Phalæna* (*Bombyx*) *mori*. In India, great quantities are procured from the cocoon of the larvæ of moths of different species. The most productive of these is the Tusseh and Arrindy Silkworms. They are both inhabitants of Bengal. The first of these, the *Phalæna*, (*Attocus Paphia* of Linnæus,) has been found so plentifully from time immemorial, as to have furnished an abundant and constant supply of coarse, dark-coloured, strong silk. This is woven by the natives into a cloth, which they call *Tusseh-doot-hies*—a favourite and durable attire of the Brahmins, and several other sects. It has the advantage of being both a light and cool wear; and, from the length of time it lasts, it proves in the end to be remarkably cheap. It is singular that this useful commodity has not found its way into the south of Europe, or the intertropical countries of America, being admirably fitted for these climates. This is a proof, among many which might be adduced, of the tardy progress of improvement, proceeding too frequently from a bigoted admiration of ancient customs.

The silk of the Tusseh Worm is durable in a *remarkable* degree; for it discovers but little symp-

ms of decay after being constantly worn for nine
ten years. These insects, which feed upon the
ugube tree, or *Byan*, of the Hindoos, and also of
e *Terminalia alata glabra* of Roxburgh, called by
e Hindoos *Asseau*, are guarded by the natives
ith the most unwearied solicitude; for, by day,
ey are the prey of crows and other insectivorous
irds, while, by night, they are eagerly sought after
y bats.

The Arrindy Silkworm (the *Phalæna Cynthia*
f Drury) spins cocoons of an extremely soft texture.
he filaments are so excessively delicate and glossy,
hat they cannot be unwound by the ordinary pro-
ess, but are spun in the same manner as cotton; and
fterwards manufactured into a loose and coarse kind
f white cloth. The durability of this thriftless look-
g material exceeds all credibility—a lifetime being
arely sufficient to wear out a dress made of it. The
atives use it for packing sheets, as well as clothes.

Besides the species above named, there are others
o be met with in China, from which silk is pro-
ured; for we find, in Young's *Annals of Agricul-*
ure,* an extract of a letter, from which it appears,
hat a recent introduction of them from that country
nto India has taken place. "We have," says the
riter, "obtained a monthly Silkworm from China,
hich I have reared with my own hands, and in

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* *Annals of Agriculture*, vol. xxiii. p. 235.

twenty-five days have had the cocoons in m basins, and by the twenty-ninth or thirty-first d a new progeny feeding in my trays. This mak it a prize to whoever would undertake the cultiv tion of it."

In the *Philosophical Transactions*,[*] we have account of a moth found in America, which p duces a cocoon, heavier and more productive th that of the common Silkworm; it, besides, h the quality of being greatly stronger, for it has be found by Latreille, that twenty filaments will be an ounce more weight than the same number ordinary silk.[†]

The inhabitants of Chimpaucing, Textula, a other places of South America, manufacture stoc ings and handkerchiefs from the ovate nests caterpillars, which feed on the leaves of *Psydi* *pyniferum* and *pomiferum*.[‡] These nests are ei inches long, and of a gray colour.

In an extensive and fertile valley, 10,500 f above the level of the sea, in the mountains of S tarosa, at Valladolid, one of the twelve intend cies into which Mexico is now divided, upon shrub *Arbutus Madrôna*, as well as other tr Baron Humboldt observed immense numbers nests similar to those last described. They, however, differed so far, in being of a dense tissue, very similar to Chinese paper, of the most immaculate and shining whiteness. They were formed into separable tissues, the innermost being thinner than all the others, exceedingly thin and pellucid. These were named the *Bombyx Madrôna,* from the plant on which they feed, by Humboldt. They are social caterpillars, and these nests are formed by their united labours. The manufacture of this silk was an object of much commercial interest among the ancient Mexicans, at least as far back as the time of Montezuma, king of Mexico, who reigned in the year 1511. These people pasted together the inner layers, to form a thick, white, and glossy pasteboard, for the purpose of writing. Humboldt says, in his *Political Essay on New Spain,** that handkerchiefs are manufactured from this silk at various places in the intendency of Oaxaca.

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[*] *Phil. Trans.* for 1759, p. 54.

[†] LATREILLE, *Hist. Nat.* xiv. p. 150.

[‡] *Annals of Botany*, vol. ii. p. 104.

Indian grass used by anglers, is said to be procured by the Chinese from the gum and silk receptacles of several of the lepidopterous larvæ.

Most of the caterpillars of butterflies and moths are formed so as to spin silk. This is of various degrees of texture and colour, according to the species; and we have already seen, that Nature has endowed them with this faculty for the protection of the pupa, and has also enabled them t construct coverings for their own comfort and safet after their exclusion from the egg. We have show that, by spinning a thread, they are also enabled t descend from a branch to the ground in safety, an also to return to a tree by the same filament. Th construction of their feet is admirably adapted f this purpose. Each of the six fore-legs is provide with a hooked claw, as in the following figure:

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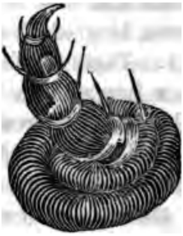
* *Annals of Botany,* vol. iii. p. 59.

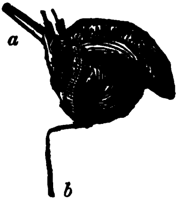
FORE-LEG OF A CATERPILLAR, GREATLY MAGNIFIED.



The whole interior conformation of silk-spinnin caterpillars differs widely from that of warm-blood animals. They have no heart, but in its stead, long tubular *dorsal vessel*, running along the bac which, according to Malpighi and other compar tive anatomists, has a pulsation varying from twent to a hundred beats in a minute: but neither Lyo net nor Cuvier could discover any vessels branchin from it, so that, if analogous to blood, it has circulation. Another important distinction between these caterpillars and vertebrate animals is, that they have no brain; their nervous system consisting of ganglions, or the nervous filaments united at intervals, by little knobs. Neither have they lungs, and they breathe by means of small spiracles, or air holes, placed in the middle of the segments, or rings, of the caterpillar, on each side; these again communicate, and end in the throat by means of tubes. The spinning apparatus is situated near the mouth, and connected by means of long slender vessels with the silk bags.

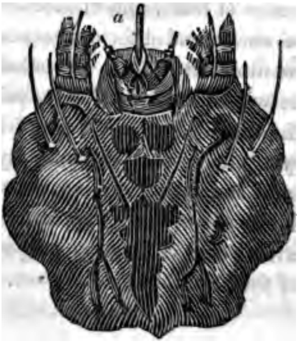
The external tube by which the silk is produced, has been termed the spinneret, which Reaumur supposes to have two orifices for the extrusion of the silk, which, however, the accurate Lyonnet found to unite before their reaching the termination of the tube; and discovered that it was composed of alternate slips of horny and membranaceous substance,—the one intended for compressing the filament into small diameter, and the other for enlarging it at the will of the animal. Its point is truncated like the nib of a pen, which admirably adapts it for applying it to any object. Lyonnet has given full and satisfactory delineations of dissections of all the silk-spinning apparatus of moths. The species he selected for this purpose was the caterpillar of the Goat Moth, *P. cossus*.

MAGNIFIED PROFILE OF THE HEAD OF THE GOAT MOTH CATERPILLAR



The spinneret is seen at *a*, and the throat, or trachea, at *b*. The shape of the tube itself will be better understood by the following figure, which is magnified 22,000 times.

The point of the spinneret is represented at *a*. The following greatly magnified view of the *Sabium*, or lower lip of the Goat Moth Caterpillar, will show the relative situations of the different parts of the spinning apparatus :



The silk tube, or spinneret, is seen at *a*. "You may sometimes have seen," says the Abbé de la Pluche, "in the workshops of goldsmiths, or gold wire-drawers, certain iron plates, pierced with holes of different calibre, through which they draw gold and silver wire, in order to render it finer. The Silkworm has under her mouth such a kind of instrument, with a pair of holes, (united into one on the outside,*) through which she draws two drops of the gum that fills her two bags. These instruments are like a pair of distaffs for spinning the gum into silken thread. She fixes the first drop of gum that issues where she pleases, and then draws back her head, or lets herself fall, while the gum, continuing to flow, is drawn out and lengthened into a double (single, according to Lyonnet) stream. Upon being exposed to the air, it immediately loses its fluidity, becomes dry, and acquires consistence and strength. She is never deceived in adjusting the dimensions of the (united) apertures, or in calculating the proper thickness of the thread, but invariably makes the strength in proportion to the weight of her body.

"It would be a very curious thing to know how the gum which composes the silk is separated and drawn off from the other juices that nourish the animal. It must be accomplished like the secretions formed by glands in the human body. I am therefore persuaded, that the gum bags of the Silkworm are furnished with a set of minute glands, which, being impregnated with gum, afford a free passage to all the juices of the mulberry leaf corresponding with the glutinous matter, while they exclude every fluid of a different quality."* If this theory be correct, then it applies equally to all the silk-spinning caterpillars.

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* *According to the discovery of Lyonnet.*

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* *Spectacle de la Nature*, vol. i.

CHAPTER III.

ON THE FOOD OF MOTHS.

THE food of the Phalæna next demands our at- ntion. The *Tinea resinella* and the Minute Moth ed on the resinous or other excretations, exuded m trees; others of the *Tineæ* eat only the paren- yma, never touching the cuticle. The *Noctua hraceaga* eats the pith alone, while others select e pollen and honey secreted in the nectaries. The rvæ of different *Tineæ*, as before observed, feed on ol; but it is wisely ordered by nature, that un- ashed wool is never touched by them. The *Tinea* scribed by Reaumur, devours the highest perfumed ocolate; and the Wax Moth caterpillars will, r want of that substance, eat paper, wool, wafers, c. The larvæ which feed on vegetables, seem to less general in satisfying their appetites, although is likely they can subsist on various kinds of food cases of necessity. Many species of lepidopterous rvæ are polyphagous, feeding on almost all kinds plants. Reaumur, however, asserts, that if a terpillar has fed for some time on any particular nt, although not the one appropriated to it by nature, it will rather die than feed upon another kind, although this would have been quite agreeable to their palate prior to eating that other plant accidentally.* We must also keep in view, that insects feed on different kinds of food in their various stages of existence, from the larva, to the imago condition, In the first state, they feed either on the leaves or other parts of plants, while the perfect insect feeds almost exclusively on the nectar of flowers.

Some of the Phalæna feed during the day, while others feed only at night, or in the evening. The *Nycterobius*, mentioned by Mr M'Leay, as inhabiting New Holland, lay up their store of provisions during the night, and feed on it through the day.

The larvæ of papilionaceous insects far exceed all others in the quantity of food they consume. They are furnished with jaws, which are admirably adapted for gnawing leaves, and act somewhat in the manner of shears.

Nature has endowed many of the animals of this order with wonderful powers for providing themselves with habitations, and these frequently constructed in a manner admirably calculated for the comfort of the resident.

The *Tinea Wilkella, Clerkella,* and others, are termed the subcutaneous larvæ, from their feeding upon the parenchyma included between the upper and under cuticles of the leaves of plants, of lilac, dandelion, and various other species. These minute animals not only feed on leaves, but also domicile within them, although not thicker than a sheet of paper. The zigzag, curved, and concentric lines, which are common in the plants above named, are the work of these larvæ. The white appearance of the lines is owing to the pulpy substance being removed. At the end of these winding passages, there is usually a minute dark-coloured speck at the termination of the labyrinth-like lines, which is the habitation of the tiny miner. So minute, indeed, are these larvæ, that a single leaf of dandelion may be considered as a vast tract of land to a larger animal, for it requires several weeks for them to traverse it.

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* REAUMUR, ii. 324.

Nothing can exceed the gorgeous attire of some of these little miracles of nature. She seems to have lavished her most splendid tints, fancifully arranged, in combination with sparkling bands and spots of golden, silvery, and pearly lustre. These, however, only become perceptible by the aid of a strong lens. If these animals were formed on a larger scale, they would far exceed every other creature for splendour of decoration. It may be asked, Why is such richness of clothing bestowed on creatures so insignificant? The answer is, that it has pleased Creative Wisdom to hold them up to man as a lesson of humility, to show that even the most insignificant worm *is robed in a habit* with which all his art cannot vie

CHAPTER IV.

ON THE HABITATIONS AND ARCHITECTURE OF MOTHS.

There is not a more interesting or remarkable department of our inquiry than the habitations and architecture of the tribe of moths. They are endowed with an unerring foresight or instinct, by which each species forms for itself a nest or habitation, constructed, in many instances, upon the most philosophical principles. The Linnæan genus *Phalæna,* or Moth, contains a vast number of species, scarcely two of which build nests alike.

The caterpillars of the *Nycterobius,* before alluded to as an inhabitant of New Holland, excavate for themselves holes in trees, especially in that splendid tribe, the *Banksia;* and to which they frequently prove very destructive, owing to the numerous cavities they make. They have a most ingenious method of defending the entrance of their abode from the attacks of the Mantes, by a kind of trapdoor of leaves and *excrement,* interwoven with silky filaments, which *they fasten firmly* at top, but leave unattached at the m, for the free egress of the inmate. They r quit their abode during the day, but regularly ut, at sunset, on their perambulations in search d, and drag to their domicile, one by one, such s as they feed upon, which they consume at leisure. One species carries the leaves of *ksia serrata*, by the footstalk, to its cell, the of which it opens with its tail, and enters backls, dragging the leaf after it.*

he larva of the *Tortrix* and *Tinea* form the s of plants, on which they feed, into comfortable convenient habitations. Some species of these, scrupulous, make more superficial abodes, by ly connecting, in an irregular packet, a quantity ves, united by a few of the silken threads which spin themselves, and there live in solitude; e others, still less ambitious, confine themselves single leaf, with one side simply folded over the r. Others, again, live in a sort of roll, which is d in shape, according to the peculiar taste of pecies, some cylindrical, others conical, like a r's sugar paper, constructed with much nicety, d at the broad end, and left open at the smaller for the ingress and egress of its inhabitant. It possible attentively to contemplate these little ciles without our admiration and wonder being ened; and we naturally marvel at the mechanical power by which it has been constructed, and how an insect, possessing neither hands nor fingers, could roll together a leaf, and keep in that roll, until it is secured by the silken filaments which completes its binding. The following is the mode in which it is constructed:—The little architect commences his operations by first attaching a series of silken filaments from one edge of the leaf to the other. These threads are pulled by the feet of the caterpillar till the sides come in contact, when he binds them firmly by shorter threads. It not unfrequently happens, that the stronger nerves of the leaves resist the efforts of the tiny architect, in which case he proceeds to gnaw them at intervals, till they are so weakened, as to be bent with perfect ease. If this is only instinct, it makes the nearest possible approach to reason; for man himself, in his untutored state, could not act with more wisdom. A very different procedure is necessary where a conical, or horn-shaped, receptacle is wished, which is not framed with a whole leaf, but with a long triangular portion cut out of its edge. The caterpillar, in this case, fixes himself on the upper surface of the leaf, and cuts, in a regular and systematic style, with his jaws, the piece necessary for his purpose, without, however, entirely dividing it from the other portion of the leaf, which naturally forms the base of his superstructure. This triangular fillet he winds round as he proceeds; and, as it generally stands in a perpendicular position, it is necessary, by some mechanical contrivance, to elevate it. To obtain this end, he puts in operation the same sort of contrivance as man would employ with an inclined obelisk, by attaching to the point of the pyramid threads, as man would do cables, and then, applying the weight of his own body in opposition, raises it to the perpendicular.*

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* *Lewins, Prodromus of Entomology*, p. 8.

A species of moth, which feeds on the lilac, forms a habitation for itself within the leaf of that tree. This it rolls up at the point of the leaf, by commencing at one end, and fixing and pulling its threads till it becomes nearly the shape of a scroll of parchment. Another species pursues a different method with lilac leaves. By a process similar to the above, it contrives to bring the extreme edges of the leaf together in the manner of a hollow tube, leaving it open at the bottom and point for its egress, as represented in the following figure :—

The Small Green Oak Moth, (*Tortrix viridana,*) an insect of a fine green colour, pursues a similar mode of constructing a habitation with the first mentioned of the lilac caterpillars, but differing in one particular, that it works on the under side of the leaves, in place of the upper surface, pulling the leaf backwards and downwards, and fixed steadily by small external cables, as represented below.

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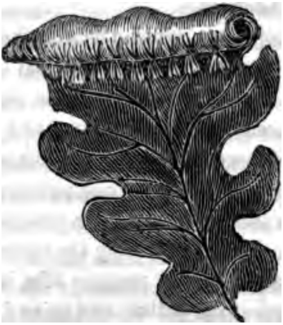
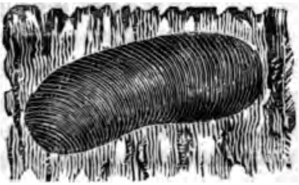
* Bonnet, ix. 188.



There are a great variety of plants, whose leaves form the habitations of different species of larvæ,—the nettle, the mallow, the sorrel, the willow, the plantain, the cypress, &c.

Among those which are called Carpenter Caterpillars, the Goat Moth (*Cossus ligniperda*) is one of the most remarkable. This species abounds in Kent, and many of the southern counties of England, where it proves exceedingly destructive to oaks, poplars, *willows, elms,* and other trees. It insinuates itself *through* the bark when very small, and gets into the tre of the wood, where it forms extensive xcavations. An idea may be formed of the f these, when it is mentioned that this cater- ows to a very large size, not unfrequently hes in length, and upwards of half an inch lth, exclusive of its limbs.

n the cold weather sets in, it excavates an ollow in the tree, sufficiently large to contain y coiled up. Professor Rennie mentions found one, in 1827, in its winter nest, which eloped in "a fabric as thick as coarse broad- nd equally warm, composed of the raspings scooped out of the cell, united with strong The following is a figure of one of these in er nest:



other of the *Tineæ* display still greater , in constructing habitations for themselves; hich feed upon the leaves of the oak, elm, nd rose trees, on the under sides of which y be frequently found during summer, parti- xemplifying this. They eat the parenchyma between the membranes, composing the upper and under cuticles of the leaves. These nests are of an oblong shape, and so artfully joined with silk threads, that the seam is hardly discernible, even with the assistance of a powerful microscope; they are of a horn shape, cylindrical in the middle, with the anterior orifice circular, and the posterior opening of a triangular form. If these habitations were cylindrical throughout, the contraction of them would be an operation requiring comparatively very little mechanical skill; but, as the two ends are quite different, so there is a necessity for both sides being dissimilar in their curvatures; and we have the assurance of Reaumur, that they require the same nicety of imitation and junction as the different pieces of which the back of a coat is composed.

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* *Insect Architecture*, p. 190.

Speaking of insects of this tribe, Mr Spence says, "Their proceedings I had the pleasure of witnessing a short time since upon the alders in the Hull Botanic Garden. More ingenious than their brethren, and willing to save the labour of sewing up two sides in their dwellings, they insinuate themselves near the edge of a leaf instead of in its middle. Here they form their excavation, mining into the very crenatures, between the two surfaces of the leaf, which, being joined together at the edge, there form one seam of the case; and, from their dentated figure, *give it* a very singular appearance, not unlike that *of some fishes*, which have fins on their backs.

r are necessarily forced to cut and sew up the site side; but, even in this operation, they show igenuity and contrivance worthy of admiration." iose species of *Tineæ* which excavate their habit- i in the middle of the leaf, separate entirely the surfaces that compose it, before they commence ng them together; and the serrated incisions e by the mandibles have the tendency to sup- the opposite edges, by interlacing with each :, so as to support the disjoined portions until are properly secured. Those Tineæ, however, h eat out their habitations from the edge of a cannot proceed upon the same principles, for, ey were to separate the inner side before they joined the two pieces, both the architect and his ling would come down. Before making the ion, therefore, they baste (to adopt a phrase by tailors) together in remote points the two branes on that side. Then, by thrusting out their , they separate, with their forceps, the inter- ate portions, while they take care to avoid ning the larger nerves of the leaf. When this ition is gone through, they proceed to sew up letached sides in a more regular style, while only intersect the nerves, which completes ingenious task.*

me other caterpillars form their dwellings entirely of silk, and similar in its general plan of construction to that last described, except in point of the material with which it is composed, and, like it, feeds on the parenchyma of the leaf alone. Pear-trees are much infested with these minute larvæ; and, in spring, they frequently beset the whole under side of the leaves with their abodes; these are of a downy russet colour, about a quarter of an inch above the surface of the leaf, and have greatly the resemblance of spines. That they are the domiciles of these minute larvæ can be easily proved, for if one of them is detached from the leaf and squeezed, a minute caterpillar will be ejected, with a black head and yellowish body. If the spot from which this habitation was removed be examined, it will be found to have a round excavation in the cuticle and parenchyma of the leaf, the size of the end of the tube. The animal, like the Arab of the desert, has the power of moving its little marquee from one place to another, and thus eating away the part immediately beneath it. All the little seared specks to be seen on the leaves of pear-trees, are the remains of their destroying powers.* The tube in which the larva dwells, and which is indispensable to its existence, is of its own manufacture, spun from silk emitted from its mouth, so soon as it emerges from the egg. When the creature enlarges in size, it increases the dimensions of its abode, by cutting it asunder in a longitudinal direction, and then introduces a slip of new materials. "But the most curious circumstance in the history of this little Arab, is the mode by which it retains its tent in a perpendicular posture. This it effects partly by attaching silken threads from the protuberance at the base to the surrounding surface of the leaf. But, being not merely a mechanician, but a profound natural philosopher, well acquainted with the properties of air, it has another resource when any extraordinary violence threatens to overturn its slender turret. It forms a *vacuum* in the protuberance at the base, and this as effectually fastens it to the leaf as if an air-pump had been employed! This vacuum is caused by the insect's retreating, on the least alarm, up its narrow case, which its body completely fills, and thus leaving the space below free of air.* If one of these cases is detached from the leaf, this fact may easily be perceived. If the cell is suddenly seized, while the insect is at the bottom, it will be found readily pulled off, as the silken cords give way to a very slight force; but, if it is done more gently, the insect gets time to retreat, in which event the case will become so firmly fixed, that some force will be required to remove it. "As if aware that, should the air get admission from below, and thus render a vacuum impracticable, the strongest bulwark of its fortress would be destroyed, our little philosopher caref avoids gnawing a hole in the leaf, contenting i with the pasturage afforded by the parenchyma al the lower epidermis; and, when the produce of area is consumed, it gnaws asunder the cords o tent, and pitches it at a short distance as befor

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* REAUMUR, iii. 100-120.

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* Forsyth on Fruit-Trees, &c. 27)

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* KIRBY and SPENCE's *Introduction*, i. 457.

When the animal attains its full growth, it assu the pupa state; and, after its appointed perio confinement, bursts its casement, and issues for small brown moth, with long legs, the *Phal* *Tinea Serratilla* of Linné.†

Sir James Smith, late president of the Linn Society, had in his cabinet the case of a lepidopte larva, which was composed of the spines of s species of *Mimosa;* these were ranged side by s so as to form a very elegant fluted cylinder. male caterpillars intermix with the pieces of tw which are less closely and regularly arranged, of dried leaves, and other light materials. larva of the *Bombyx vestita* forms a similar hab tion of pieces of small twigs; and the *Tinea vic* covers itself with short pieces of the stems of gras placed transversely, and united by means of sil filaments into a pentagonal or hexagonal c Reaumur describes the domicile of a caterpilla the same family, which is composed of square pi ıe leaves of grasses, united at one end only, and lapping each other like the imbricated tiles of a ; and he notices another, similarly constructed, inute portions of the twigs of broom.*

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* Kirby and Spence's *Introduction*, i. 457.

† Anderson's *Recreations*, ii. 409.

'he *Tinea lichenum* forms pieces of lichen into a se, resembling in shape some of the turreted snail ls. Mr Kirby noticed many of them on an oak arham, in June 1812. Another caterpillar of *Tinea,* which likewise feeds on lichens, does not ne its habitation of them, like the last-mentioned ies, but connects together, with silken cement, ns of stone, from walls where the lichens grow. re is a curious memoir on the subject of these cts in the *Transactions of the French Academy,*† M. de la Voge. That gentleman supposed that, use these larvæ were found in such abundance mouldering walls, that they possessed the pro- y of eating stone, and considered them as the ns which Time employed to carry into effect slow but certain destruction of all things; but ch ought rather to be attributed to atmospheric ion. Reaumur justly remarks, that these larvæ so small, and the particles of which their cover- is composed so minute, that ages were not suffi- t for them to produce any perceptible impression. They have been termed Stone-mason Caterpillars;

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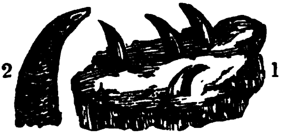
* Reaumur, iii. 148-9.

† *Trans. French Acad.* x. 458.

their tents are shown in the following figure. Those adhering to the stone at No. 1, are the size of nature, and No. 2, is a magnified representation.



Various caterpillars, which produce their habitation from pure silk, are not satisfied with a single coating of it, but spin for themselves an upper garment, resembling a cloak, open at one side, which Reaumur appropriately terms "*Teignes à fourreau à manteau.*"* A remarkable peculiarity of these coverings is, that instead of being fabricated of a firm and close texture, they are composed of imbricated, transparent scales, like those of a fish.

The dwellings of the larvæ above described might, with more propriety, be rather termed clothing than houses, as they fit the animal like a vestment. This is more especially the case with some of the *Tineæ*, (or Clothes Moths,) which cover themselves with a coat of the very same materials as mankind, of wool or hair curiously interwoven together. Dr Paley asserts, that "the *human* animal is the only one which is naked, and the only one which can clothe itself."† These little creatures, like man, are born naked; and, like man, are capable of covering themselves, thus contradicting the Doctor's theory. Nay, these larvæ, which man in general looks upon with contempt, are endowed with ingenuity in some respects superior to his own; for the moment they have inhaled the breath of life, they prepare to cover themselves, and this they effect in a manner more consonant to their condition, than the dress of savage man is to his state. The shape of the habiliments of larvæ consists usually of a cylindrical tube, open at both ends. These are woven from wool or hair, ingeniously cut down by the larva of the *Tinea,* which is compactly incorporated with silk drawn from their mouths, generally made more comfortable and suitable to their tender skin by a lining of the softest silky texture.

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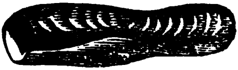
* *Reaumur*, iii. 206.

† *Natural Theology*, p. 230, 8vo edition.

CASE OF THE CLOTHES MOTH, (*Tinea pellionella.*)

These they wear from infancy to maturity; wisely disregarding change of fashion, while they have comfortable and convenient coverings. They, no doubt, require to be enlarged as the animal increases in bulk; and this they accomplish with the greatest dexterity and accuracy. To lengthen their covering is an easy matter, by adding a ring of hair or wool *to each end; but* when too narrow, the task is somewhat more difficult. But they set about it in a manner similar to the mode employed by a tailor, by slitting the case open from one extremity to another, and then inserting a piece of the breadth required, with the utmost accuracy. The cut is, however, not made from one end to the other at once, as in that event the sides of the case would get too far apart, and leave the tenant naked. It therefore only cuts each side halfway down, as shown in the following figure:



and, after having inserted the necessary addition, proceeds to cut the other half, and fills it up in the same manner. In this way four separate pieces are inserted. As the colour of their covering always depends upon the colour of the stuff from which it is taken, it not unfrequently happens, that when the animal has made its first envelope of blue, it may afterwards make its way into a red stuff, and consequently, the additions will be of that colour, giving the creature the appearance of a little harlequin.

The injury sustained by mankind from these minute depredators, does not proceed from the quantity which they consume as food and clothing *alone*; for, as they proceed along the surface of fur *or woollen* stuff, the long hairs impede their progress and, being possessed of natural instruments whereby they are enabled to cut a passage for themselves, they smooth the surface of every obstacle in their route.

Those who wish to investigate the singular phenomena presented by these minute beings, have only to leave an old coat, or other piece of dress, in any dark or damp situation, and it will soon become the retreat of the *Tinea,* and afford ample opportunities for studying their habits.

CHAPTER V.

OF SOCIABLE CATERPILLARS, OR THOSE WHICH LIVE IN SOCIETIES.

We shall now proceed to describe the habitations of a different tribe. Most individuals must have observed, during their walks through a garden or orchard, the fruit-trees disfigured by what would appear a strong and thick spider's web. If these are attentively examined, it will be found that they differ materially in their construction from those spun by spiders, for they enclose on every side an angular space, and will be found filled with the larvæ of *Bombyx chrysorrhœa*. The web is the produce of their united labour, as they are gregarious animals, delighting to dwell in society. The female deposits from three hundred to four hundred eggs, and, as soon as these are hatched by the genial rays of the sun, the whole community commence their operations. Their first procedure is very simple: they *form a sort of* coat of the single leaf upon which the *are hatched,* over which they construct an a composed of silken filaments, stretched from one end to the other. In some cases, where the colony is numerous, they construct two leaves in this manner, where they reside for some days, until they have gained sufficient strength to fit them for a larger and more complete work, sufficient to contain the whole colony. In the formation of their new habitation, they do not adopt any symmetrical shape, except that it is always angular; sometimes it is flat, and frequently roundish. Their first operation is to spin a close and well united silken web round the end of two or three twigs, and the leaves attached to them, adjoining each other, and as close as possible to their original abode, taking care that it will be large enough to accommodate them when they shall have arrived at maturity. They then proceed to divide the interior into apartments, by partition walls of woven silk, and an appropriate door is left in each. These are their retreats in rainy or stormy weather; for, when the day is fine, they spread themselves over all the adjoining leaves, for the purpose of feeding. These creatures are sure prognostics of atmospheric changes; for some considerable time before bad weather, they are sensible of its approach, and speedily retire to their cells. In these, also, they repose during the periods when changing their skins. As soon as winter sets in, the whole society shut themselves up in this abode, which, by repeated layers of silk, they have rendered impervious to the rain and wind. Here they continue in a torp till the beginning of April, if the season is able, when they are recalled into action genial warmth of the sun, and they quickl abroad, and devastate all the young and leaves in the neighbourhood of their d To prevent the possibility of their structur damaged by the shoots inside, they gnaw shoots of leaves off as soon as they are form

By this time the caterpillars increase gr size, which obliges them to add to their dw

The caterpillar of the Processionary Moth (*I processionea*) constructs its nest in a different from the above, although the materials are th These larvæ feed universally on the leaves o ent species of oak. They always attach thei to the trunk of the tree in place of the branch frequently at a considerable height from the It is formed like a large irregular knot, or p rance, and at a distance is frequently taken for of lichens, as the colour of the silk of whi composed is gray. This nest is sometimes e inches in length, and six in breadth, swe the centre about four inches from the tree ingenious architects leave only a single aper their entrance and retreat. In their young st Processionary Moth caterpillars differ mater *their* habits from that of the *Bombyx chrys* habitation; they content themselves with occupying temporary tents, till they have arrived at above two-thirds of their adult size. They then congregate, and, by their united labours, construct the large habitation above described, where they dwell in great harmony, until they have gone through the purgatory of their chrysalis state, when they assume their perfect condition.

The *Bombyx phœorrhea, neustria,* and many others, construct similar nests; but it is unnecessary to enter into a detail of these.

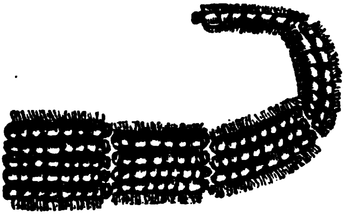
Reaumur gives an interesting account of the Gold-tail Moth, whose caterpillars are gregarious, and spin for themselves a silken tent. They are of that family of Bombyces, which pull from their bodies the hairs wherewith to envelope their eggs. The moment the larva emerges from the egg, it commences feeding: it is quickly joined by another, which places itself alongside the first, until a succession of these reach across the leaf: when this is completed, a second pile is begun, and then a third, and thus they continue to rank themselves till the whole upper surface of the leaf is covered. It seldom happens that a single leaf is large enough to contain the whole community; those who cannot be accommodated pursue the same arrangement on a contiguous leaf. When they have satisfied their hunger, by a simultaneous impulse, they set about weaving a habitation for their mutual comfort. This they at first

construct in a simple style, by a vaulted we
covering the leaf they inhabit. In the cour
however, a larger one is formed, with a pl
apartments, strong in its texture, and mag
its appearance, and capable of protecting the
the inclemency of the weather, and the in
enemies. And with the style of Eastern mag
they spin a soft carpeting over every part o
of trees, where they may have occasion t
search of food. They seldom feed in the
heat of noon-day, but repose in their te
also, they pass part of the middle of n
however, seldom happens that they are
one time. In this comfortable retreat th
their skins, and to it they fly for refuge when
Here, also, they spend the winter in a
torpor, emerging in spring, feeding again in
but about the end of May, or beginning
they disperse, and, eating for a month in
change their condition into a *pupa*. It is w
caterpillars finally abandon their nests that
taken possession of by spiders, which has
to the popular, although erroneous belief,
are the parents of these larvæ.

The most remarkable of this tribe of inse
live in imperfect societies, are those wh
pillars, upon certain occasions, preserve a
line of march. Bonnet gives an interestin
of the Phalæna (*Bombyx*) neustria, wh

pillars are of that tribe which march rank entire. They sometimes advance in straight lines, and at others in curves of various inflection. They are of a fiery colour, which gives them the appearance of a cord of gold, extended on a silken fillet, of the most immaculate whiteness. It is when travelling on this carpet of silk, to feed on the leaves of their favourite plants, that this appearance is exhibited. The *Pityocampa*, another moth which congregates in a common receptacle of pine leaves, united by filaments of silk which they spin, is also of this military order. They follow each other in a variety of mazy turnings, which gives the most animated picture of ever varying living wreaths. The whole chain of caterpillars move in unison, and at a proper distance from each other, in the most perfect order; and when their leader stops, the whole halt in an instant.*

A DIVISION OF PROCESSIONARY LARVÆ.



The Processionary Moth affords a still more

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* Bonnet, ii. 57.

amusing picture, when it sets out in quest
It is a native of France, and feeds on the
the oak. They live in families of from six
hundred individuals. In their earliest st
have no settled habitation, but pitch th
wherever their fancy directs; and it is not
are two-thirds grown that they form a domi
enough for the whole community, which
already described. It is generally about su
the colony leaves its quarters, and sets ou
excursive rambles. They are led by a ch
regulates all their movements; three, or so
four, of his immediate followers, move in t
line, the head of each touching the tail of
cursor. Their movement is in a sort of p
form; for after these Indian file, there come
in pairs, after them a number in threes, fo
increasing systematically, till the column
cluded by rows of from fifteen to twenty. T
army (if I may be allowed the expressi
ceeds with a steady movement, each anima
ing in direct line that which precedes it.
leader makes a turn at any particular p
whole of his followers arrive at the same
fore they make a wheel. They may be g
this movement by a particular odour lef
leader on the line of his march. This is n
ever, their invariable order of proceeding.

The leader has nothing different in his

ance from the others, and is in all probability the one nearest the tent when they set out; at least, such is Reaumur's opinion. When he first issues from his retreat, he moves forward about two feet, less or more, according to the numbers of his followers, who now appear from out their cell, and rank themselves in the manner before described, and when this is completed, they move off with the regularity of an army marching to a band of music.

The larvæ of the Processionary Bombyx are sometimes, although rarely, seen in the open air at mid-day; in which case they are usually found packed one above another, as if dead; and although they may occupy a considerable space, yet they are not easily discovered, from the surrounding leaves of grass; at other times they are observed lying side by side. In the former of these conditions they are also frequently found in their habitations. It not unfrequently happens that these families disperse into smaller groups, and never again unite.*

Our enlightened and scientific countryman, Mr Skene of Rubieslaw, on an arid coteau above Tolonai, in Provence, France, witnessed a procession of a different species of caterpillar, which marched in Indian file, or in a single row, the interesting account of which I shall transcribe in his own language:—

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* Reaumur, ii. 180.

“I observed,” says he, “what appeared to m a very slender snake writhing across my path, whic but for the unusual season for these reptiles to a pear, should no doubt have passed unheeded. Up examination, however, it turned out to be the order emigration of a colony of large caterpillars. Th were proceeding assiduously along the rocky pat in a line of march by single files, and so close, th they appeared to have a hold each of his neighbou tail, and the continued wave formed by their moti had a very singular effect. The stony surface of t path rendered their progress exceedingly tortuou and interrupted by much climbing over stones, they seemed in general more disposed to go ov the top of a stone than round its base. When su obstacles occurred, the march, notwithstanding, d not sustain the slightest derangement, as no troo could mark time with greater precision and patien than the rear of the line, while the front was e gaged in climbing over any obstacle, or the lead had stopped to examine the difficulty; the front, i their turn, tarrying until the rear had succeeded i surmounting the obstruction which the front ha just passed. They were twenty-two in numbe and nearly of the same size, except one, considerabl larger than the rest, whose place was exactly in th centre of the line. The leader, on the contrary *was rather* smaller than any of the rest. A larg *precipitous* stone was in their way; the lead reared up, moving his head from side to side, as if gazing at it, or willing to reach some corner; and leading his troop round, he frequently performed the same examination, until they reached a small bush, round the stem of which he ascended, the long line following with perfect confidence, and by means of a branch of the bush, they attained footing on the stone.

"Traversing the stone, the opposite side of which was quite precipitous, and pretty high, it became uncommonly interesting to see how this intelligent general would proceed. He examined with accuracy, trying every possible break, during which time the main body remained patiently waiting, and without making the slightest attempt to assist in the examination, which their leader conducted with much activity and solicitude. At length, after having ascertained the pass to be quite impracticable, he resolved upon a countermarch, which was instantly performed with the most surprising regularity. For the whole line in succession advanced to the wheeling point on the brink before they turned, performing the evolution with as perfect precision as the best trained troops, the advancing and retreating lines passing close alongside of each other, and even climbing the same twig, while the front line descended without confusion, passing even over each other's bodies without interruption or hesitation.

"*Having* completed their descent in the same

manner as they had mounted, a new line
tion was taken, which, however, was very
alarmingly interrupted by the arrival of
leading an ass loaded with brushwood,
some branches trailed along the path.
passage of this formidable assailant, I retur
the same anxiety to examine the state of m
and found that they had suffered materi
the disaster, and were thrown into the grea
fusion. The line of march had been b
considerable body still followed the leade
quickened pace; others, united in parties
or four, regularly keeping their position in
of each other, while their temporary
sought, with evident anxiety, to find out
body, hastening first to the one side, an
the other. A good many were scattere
and much distressed, seemingly uncertain
proceed. I took each of them up in its tu
with a view to ascertain the range of the
placed them at different distances from
body, with their heads turned towards
found that they uniformly remained quit
scious of its presence, until placed withi
inch of each other. They then approac
evident eagerness, and were readily admi
the line, by the rear halting until they h
their places.

“I put one of these stragglers in front

tail to the leader's head, but he pertinaciously refused the honour of conducting the line; a considerable sensation seemed to be communicated through the whole body at this attempt at usurpation, of which they seemed to become aware, but by what means I could not discover. As soon as this forced usurper was at liberty, he turned round to the leader, who repulsed him with vigour, and hit at him, upon which he retreated hurriedly along the line, constantly trying to get into his place, but was hit at by every one as he ran the gauntlet, till at last a good-natured friend permitted him to join the line. I then took out the large one, who was obviously a stupid fellow, when the rear immediately closed up the breach. I placed him at the head, and used every inducement to make him take the lead, but in vain. He seemed much confused by the buffets given to him by the active little Bonaparte whom I wished him to supplant, so that probably he would have failed in regaining his place, had I not given him some assistance, out of sympathy for the distress my experiment occasioned him. He seemed delighted to get into his place again, but was so much confused by the adventure, that he mistook the first sharp turn the line came to, and threw the whole rear into confusion. They broke their line, and much consternation and bustle ensued, until each had replaced his head close to his neighbour's tail.

"I now took up the leader, obviously less,
more active and intelligent than the rest, wh
alarm instantly spread over the whole line.
pected the second to take the command,
seemed the most distressed of any, and
sought about from side to side; and, in h
plexity, he turned quite around, as if consultir
his follower. The hesitation and confusion w
universal. Various parties broke off as the i
sion reached the rear, and sought anxiously
returning again to the line. Having repla
leader at the head, he instantly took the com
and advancing with confidence, and conducti
whole line in perfect order. When I now
rupted their march, the main body no long
hibited their former anxiety and impatience
the leader was removed, but seemed to wai
perfect composure and confidence until the ol
tion was overcome, which the leader used
means and ingenuity to accomplish. It d
occur to me till I had left these amusing tra
to try the experiment of placing the leader
rear, in order to observe how he would be
degradation, and to ascertain if the head
column would have been thereby changed."*

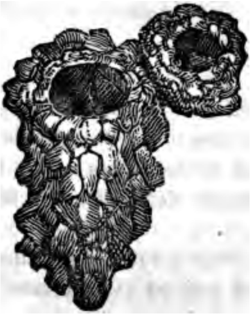
Besides those larvæ which conceal themselve
transform in their cocoons, there is a tribe
burrow under ground; these have been called

---

* Brewster's *Journal* of Science, ii. 94.

Mason Caterpillars. Among them may be ranked the Death's Head Sphinx, plate LXXI. Some of these make a rude masonry of particles of earth, united by silk or gluten, varying in form according to the species.

NEST OF THE EARTH MASON LARVA,
(The Water Betony Moth,)



which is generally of an oblong shape, although they are not always uniform. The interior is smooth, lined with a fine tapestry of silk, and polished.

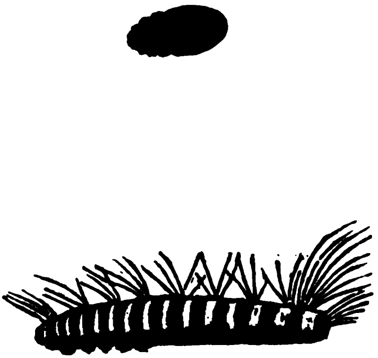
GENUS *PHALÆNA*, OR *MOT*

THE antennæ of moths for the most part gr
taper from the base to the tips; the tongue i
and the mouth without jaws; the wings, v
rest, are generally deflected; the flight m
nocturnal.

These fly abroad only in the evening, and
the night, and feed on the nectar of flowe
larva is active and quick in motion, more
cylindrical in its shape. These prey voracio
the leaves of various plants; the pupa is qui
more or less cylindrical, pointed at the tip
both ends, and is generally enclosed in a
An example of the larva of the Pink Unde
Moth is given in plate 72, under figure; a
pupa of the same Moth, is represented in the
figure.

Linnæus divides the genus into the fol
sections:—

Section I. BOMBYX.—The antennæ are



72.

LARVA AND CATERPILLAR OF THE PINK UNDER-WING MOTH.
Phalæna Jacobeæ.—Britain.

with two compressed reflected feelers; the tongue is short and membranaceous, obtuse and bifid; the caterpillars have sixteen feet, often hairy; and the pupa is pointed at the tip. This section is subdivided as follows:—

a. with the wings expanded.
b. with the wings reversed.
c. with the wings deflected.
d. with the wings incumbent.
e. with the wings convolute.

Section II. GEOMETRA.—The antennæ are filiform; the feelers are cylindrical; the tongue is projected, membranaceous, setaceous, and bifid; the larvæ have from eight to ten feet, six of which are pectoral, two caudal, and sometimes two subcaudal; the pupæ have pointed tips. The following are the subdivisions of this section:—

a. the antennæ are pectinated.
b. the antennæ are setaceous.
c. the wings are forked and connivent.

Section III. NOCTUA.—The antennæ are setaceous; the feelers are compressed and hairy, with the tip cylindrical and naked; the tongue is projecting, horny, setaceous, and bifid; the larva has sixteen feet; the pupa is pointed at the tip. The following are the subdivisions of this section:—

a. with the wings expanded.
b. with the wings flat and incumbent, and the thorax smooth.

c. with the wings flat and incumbent, and the thorax crested.

d. with the wings deflected, and the thorax smooth.

e. with the wings deflected, and the thorax crested.

Section IV. Hyblæa.—The antennæ are setaceous; the feelers are projecting, compressed, dilated in the middle; the lips are projecting and active.

Section V. Hepialus.—The antennæ are moniliform; two feelers, which are reflected and hairy, between which is the rudiment of a bifid tongue; the larvæ have ten feet; they feed on the roots of plants; the pupæ are folliculate, cylindrical, and pointed at the tip.

Section VI. Cossus.—The antennæ are short and filiform, with two very short cylindrical, deflected feelers; without a spiral tongue.

Section VII. Pyralis.—The antennæ are filiform, with two feelers equal, almost naked, cylindrical at the base; the middle dilated into an oval, and subulate at the tip; tongue projecting, setaceous, and bifid; the wings are very obtuse, and slightly curved at the exterior margin; the caterpillars have sixteen feet, and make nests in the leaves on which they feed, and are of that kind known by the name of Leaf-rolling Caterpillars.

Section VIII. Tinea.—The antennæ are setaceous, with four unequal feelers; the larvæ are found in houses, among linens, and woollen cloths and furniture, in which they eat holes, and to which they are very destructive.

Section IX. ALUCITA.—The antennæ are setaceous, with the feelers divided to the middle, the inner division very acute.

Section X. PTEROPHORUS.—With two linear naked feelers; the tongue is exserted, membranaceous, and bifid: the wings are fan-shaped, divided down to the base, and generally subdivided as far as the middle: the larvæ have sixteen ovate, hairy feet; the pupæ are naked, and subulate at the tip.

Modern naturalists have taken a different view of the arrangements of papilionaceous insects, and formed them into various orders and new genera; these we shall describe at length in our third volume.

THE PINK UNDER-WING MOTH.

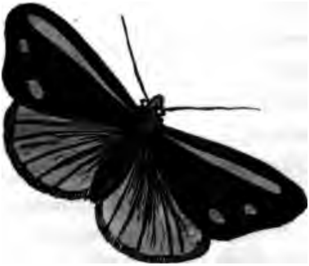
Phalæna Jacobeæ.

PLATE LXXIII.

Phalæna Jacobeæ, *Linn. Syst. Nat.* ii. p. 239.—*Turton's Linné*, iii. p. 220.—*Donovan's Brit. Ins.* ii. pl. 45.—*Harris's Aurelian*, pl. 11.

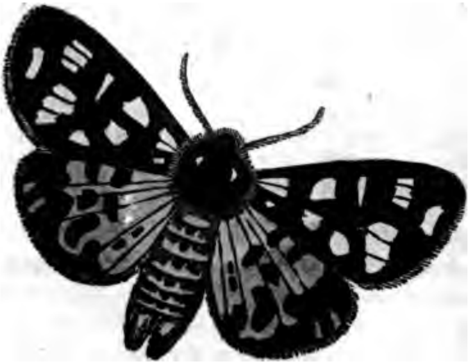
The upper wings are of a brownish black, with a transverse pink band, and two ovate spots on each; the under wings are pink, with fimbriated margins; the body is reddish brown, the eyes white, and the antennæ taper from their insertion to the tips.

The caterpillar is of a rich golden yellow, annulated with deep black; the segments are furnished with a little tuft of long hairs between each, which are much longer on the head; it is found in the latter end of July, feeding on the ragwort. It changes into a chrysalis in the beginning of August, in which state it lies on the surface of the earth during the winter; and it emerges the perfect moth in May following, towards the latter end of the month. This is one of the prettiest of our British moths.



73.

PINK UNDER-WING MOTH.
Phalæna Jacobeæ.—BRITAIN.



74.

THE CREAM SPOTTED TIGER MOTH.
Phalæna Villica.—BRITAIN.

THE CREAM-SPOTTED TIGER MOTH.

Phalæna Villica.

PLATE LXXIV.

Phalæna Villica, *Linn. Syst. Nat.* ii. p. 820.—*Turton's Linné*, iii. p. 222.—*Donovan's Brit. Ins.* ii. pl. 71.—*Harris's Aurelian*, pl. 4.

The upper wings are black, with from eight to nine large irregularly shaped cream coloured spots; the under wings and body are of a rich yellow orange, or approaching to golden yellow, variously clouded with large black irregular patches; the body has a row of equal black spots down the middle; the thorax is black, with two cream coloured spots on the back; it is fringed all round, as are also the wings.

The caterpillars of this moth are black and foxy, or hairy, with pink legs; they feed on chickweed, which is their favourite food, but they will also eat the leaves of the currant, white thorn, nettle, grass, &c., if the former cannot be readily procured. They have attained their full size by the latter end of April, when they change into a chrysalis, and, towards the end of May, they appear in the winged state.

The Cream-Spotted Tiger Moth is by no means so frequently to be met with as the Great Tiger Moth, (*Phalæna caja,*) but, in the happy combination of its colours, it surpasses both it and every other British species of that tribe which are trivially named Tiger Moths. It is most frequently to be found on banks which face the rising sun.

The English specimens of this insect rarely exceed two inches and an eighth from the tip of one wing to that of the other. The one from which our figure is taken was a German specimen, and measures two inches and a half.

75.

THE WANDERING MOTH.

Phalæna Errota.—SURINAM.

THE WANDERING MOTH.

Phalæna Errota.

PLATE LXXV.

Phalæna Errota.

The wings of this curious insect are black, with a sesquitertious brownish orange band running from the centre anterior margins of the superior wings across both upper and under ones, and a pale blue macular transverse band about the middle of the inferior wings; the body is reddish brown, and the antennæ short and smooth.

The Wandering Moth inhabits Surinam, where, according to Madam Merian, it is rare.

THE FOOTMAN MOTH.

Phalæna Grammica.—FEMALE.

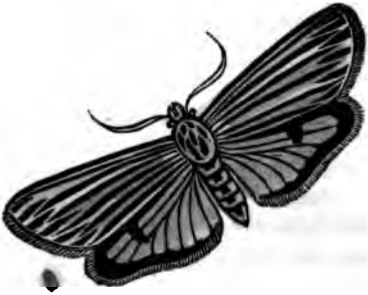
PLATE LXXVI.

Phalæna Grammica, *Linn. Syst. Nat.* ii. p. 830.—*Turton's Linné*, iii. p. 221.—*Donovan's Brit. Ins.*—*Merian, Ins. Europ.* i. pl. 5.

UPPER wings of a fine golden yellow, transversely streaked with black; the under wings and body of a very bright golden yellow, with a black terminal band; the whole are fringed.

This elegant species is introduced among the British lepidoptera, upon the most satisfactory authority, namely, that of Mr Donovan, who found a living specimen of it on the island of Anglesea, in the month of September, under the shade of a little cluster of stones and bushes, near Manachty, the northern extremity of the island, and at no great distance from the road to Grogridy.

It had not before been noticed as a British insect, till discovered by this indefatigable author, to whose industry the British Fauna owes many of its novelties. It is not unfrequent in Germany, and several other *parts* of Europe.



76.

THE FOOTMAN MOTH.

Phalæna Grammica, Female.—Britain.

It is rarely to be met with in the larva state, and feeds either on the plain-tree or ash. The larva is brown, with a white dorsal line, and rufous legs ; the pupa is rust coloured.

THE PANTHONA MOTH.

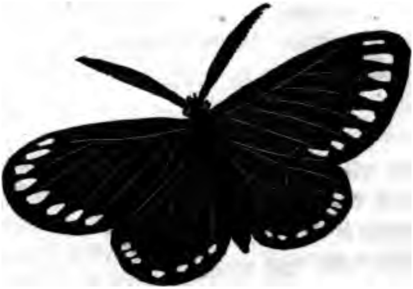
Phalæna Panthona.

PLATE LXXVII.

Phalæna Panthona.

The wings are black, with a white macular band running round their posterior and anal margins. The body is slender, of a beautiful sky blue, as are also the head and antennæ; the eyes are bright scarlet.

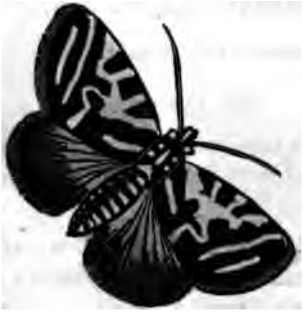
This insect inhabits China, but we know nothing of its history.



77.

THE PANTHONA MOTH.

Phalæna Panthona.—CHINA.



78.

THE MARGATE BEAUTY MOTH.

Phalæna Sulphuralis.—Britain.

THE MARGATE BEAUTY MOTH.

Phalæna Sulphuralis.

PLATE LXXVIII.

Phalæna Sulphuralis, *Linn. Syst. Nat.* ii. p. 881.—*Donovan's Brit. Ins.* No. 333, pl. 339.—Bombyx Lugubris, *Fabr. Ent. Syst.* ii. p. 1, 467.

The upper wings are of a bright yellow, variously clouded with black; the under wings are of a purple brown; the whole fringed with a broad border of the same colour. The thorax and body agreeing in colour with the upper wings, spotted and barred with deep black.

This is scarce as a British moth. It is said to have been first discovered at Margate, and from this circumstance was afterwards known amongst English collectors by the name of the Margate Beauty. Another insect, by no means similar, has, however, received the same name, having likewise been first met with at Margate.

The size of this moth, from tip to tip, is about five eighths, or about one third the size of our figure.

THE MATRONULA MOTH.

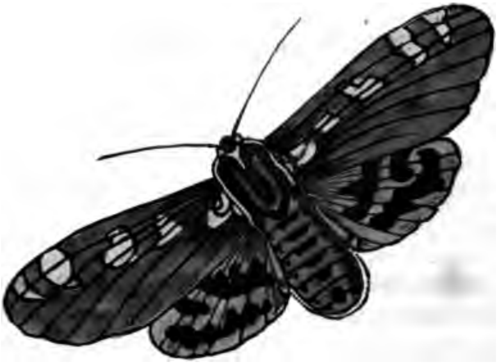
Phalæna Matronula.

PLATE LXXIX.

Phalæna Matronula, *Linn. Syst. Nat.* ii. p. 835.—*Shaw's Naturalists' Miscellany*, pl. 932.—*Merian's Insects of Europe*, p. 53, No. 5.

The superior wings of the Matronula Moth are of a rich fawn coloured brown, with two abbreviated rich golden yellow bands, and three large spots on each wing,—the whole forming a kind of macular transverse band on each wing; the inferior wings are ochre yellow, with three large clouds of black on each; the head and back are black, the latter with a golden band on each side, and a spear-shaped mark of the same colour under the head; on the back is a horseshoe-shaped band of rich crimson; the eyes are golden-yellow, and the antennæ black, long, and smooth; the abdomen is bright scarlet, spotted with black; at the upper margin of each of the annulations are small spots of the same colour on each side.

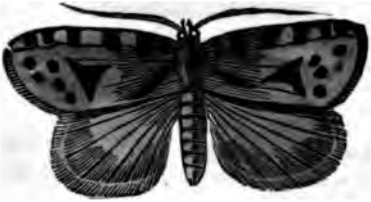
This moth is a native of various parts of Germany, where its larva is said to feed on the leaves of the common mugwort, the *Artemisia vulgaris* of Linnæus.



79.

THE MATRONULA MOTH.

Phalæna Matronula.—GERMANY.



80.

THE LETTERED MOTH.
Phalæna Litterana.—BRITAIN.

THE LETTERED MOTH.

Phalæna Litterana.

PLATE LXXX.

Phalæna Litterana, *Linn. Syst. Nat.* ii. p. 876.—*Fab. Ent. Syst.* iii. p. 2.—*Donovan's Brit. Ins.* pl. 355, fig. 2.

The upper wings are rhombic, and of a leek green colour, spotted and patched with black; the under wings are of a pale fawn colour; the thorax is of the same colour as the upper wings, and the abdomen like those of the under wings; the antennæ taper from the base to the tips. The wings are all fringed round.

This rare and beautiful little insect is a native of Britain, and is not quite six-eighths of an inch in breadth. It is not unlike the Phalæna Squamma.

THE CURRANT MOTH.

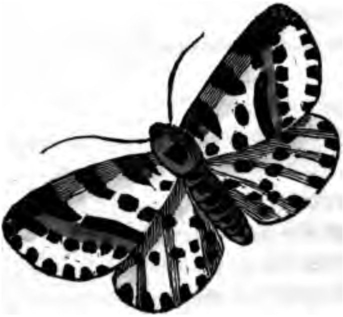
Phalæna Grossulariata.

PLATE LXXXI.

Phalæna Grossulariata, *Linn. Syst. Nat.* ii. p. 867.—
Donovan's Brit. Insects, pl. 4.

The wings of this very common species are white, covered with a great variety of black spots and fillets; on the upper wings is a sesquitertious bright orange band, bounded on its inner edge by an interrupted band of black, and on its outer edge by a row of equidistant black spots; the body is of the same colour; the segments have each a black spot; the head and eyes are black; the antennæ are long, slender, and tapering.

The caterpillar is white, with black spots on the back; the belly is yellow; and at the insertion of the annulations is a tuft of very fine hairs; it feeds on gooseberry and currant bushes, and generally emerges from the egg in May. The caterpillar, previous to its change into the pupa state, spins for itself a web of a very slight and delicate texture, by which it is suspended horizontally against the *branches* of trees. The pupa is black, with a yellow



81.

THE CURRANT MOTH.

Phalæna Grossulariata.—Britain.

colour on the back; and is transformed into the perfect, or imago state, in July.

There are few creatures whose ravages are more severely felt than the larva of this insect, and every means possible should be used to eradicate them; for, if once they find a lodgement, it is no easy matter to get rid of them.

A friend of mine in this city, who has a good garden, and is celebrated for his humanity, had a range of the finest wall-currants which I ever saw totally destroyed by these insects. He would not allow them to be killed when they first made their appearance, and the third year afterwards they became so numerous, as to eat up every leaf on the bushes; and, at last, he was forced to root them out to get rid of these pests, which his ill-judged humanity had harboured and encouraged.

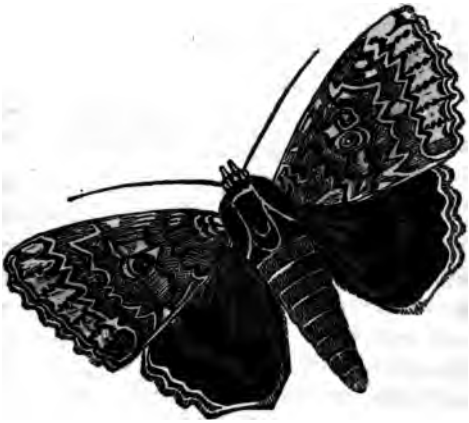
THE CRIMSON UNDER-WING MOTH.

Phalæna Sponsa.

PLATE LXXXII.

Phalæna Sponsa, *Linn. Syst. Nat.* ii. p. 841.—*Turton's Linné*, iii. p. 293.—*Donovan's Brit. Insects*, pl. 324.

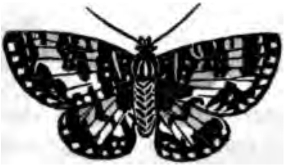
The antennæ are like threads; the tongue spiral; the thorax is crested; and the abdomen furnished with tufts of hair, one on each annulation on the belly. The body is fawn coloured, brown above, and gray beneath. The upper wings are gray, clouded with brown, and covered with zigzag lines and striæ, and two ocellated spots of orange; under wings, of a rich crimson colour, each with a transverse cloud of deep black, and a broad margin of black, fringed with white; all the margins are pretty deeply indented. The caterpillar is clouded with buff, brown, and gray; it feeds on the willow, and grows to about two inches and a half in length; and it is difficult to distinguish it from the bark. They are full fed about the beginning of July, when they change into the chrysalis state; it is gray, with a tinge of red. The moth bursts from the chrysalis August, and flies in the day-time.



82.

THE CRIMSON UNDER-WING MOTH.

Phalæna Sponsa.—BRITAIN.



83.

THE ARGENT AND SABLE MOTH.

Phalæna Hastata.—BRITAIN.

THE ARGENT AND SABLE MOTH.

Phalæna Hastata,

PLATE LXXXIII.

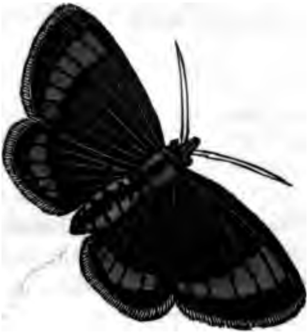
Phalæna Hastata, *Linn. Syst. Nat.* ii. p. 870.—*Clerk Phal.* i. fig. 9.—*Donovan's Brit. Insects*, pl. 129.

The wings of this moth are white, beautifully marked and spotted with black; the thorax is black, with three longitudinal white spots on the back; the abdomen white, striped with black.

The Argent and Sable Moth is a very scarce British insect in the fly state, though its young caterpillars are by no means uncommon in several parts of Kent; especially in the narrow lanes in Darentwood, Dartford, in April, or early in the month of May. It is, however, very difficult to breed them, as they generally die in the pupa state, or before they cast their skins, when caterpillars. Donovan mentions them in the summer of 1795: he took several specimens of the caterpillar and bred them, and yet he could only procure the transformation of one moth, and that so crippled, as merely tó enable him to ascertain the species.

The small caterpillars are of a dark purplish colour; when nearly full fed, they have a yellow under side, marked with black. Before they change to the pupa state, they become almost brown.

They continue in the pupa condition for a month, and the moth is transformed in June. The food of the caterpillar is white thorn.



84.

THE FRIENDLY MOTH.

Phalæna Amica.—AFRICA.

THE FRIENDLY MOTH.

Phalæna Amica.

PLATE LXXXIV.

Phalæna Amica, ***Turton's Linné.***

The wings are black, with an articulated crimson band on each, a little way from the margins, which are fringed; the body is of a chestnut brown; the eyes crimson; antennæ, long and smooth; and with a transverse crimson fillet across the back, immediately under the head.

This rare moth is a native of Africa.

THE HEBE MOTH.

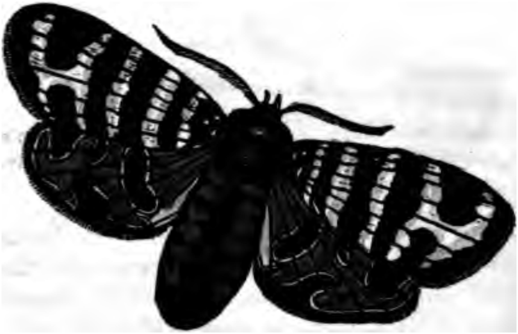
Phalæna Hebe.

PLATE LXXXV.

Phalæna Hebe, *Linn. Syst. Nat.* ii. p. 820.—*Turton's Linné*, iii. p. 222.—*Frisch.* vii. pl. 7. fig. 9.—*Roes.* iv. pl. 27, fig. 1, 2.

The upper wings are black, with transverse bands of white, which are edged with pale cream colour; the under wings of rich crimson, with curiously shaped clouds of black, which are edged with golden yellow; the head and body are black; below the head is a transverse spot of bright crimson; the antennæ are long, black, and setaceous, decreasing from the base to the tips; on each side of the body is a row of six large, circular crimson spots, with a line of the same colour passing through them. The abdomen, crimson.

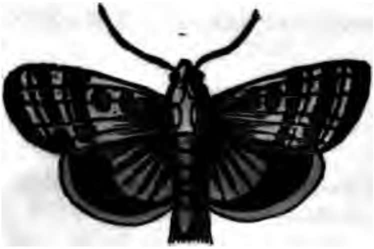
This highly beautiful species is figured of the natural size; it is a native of Germany, and some other parts of continental Europe, but has not hitherto been found in Britain. The larva, or caterpillar, is solitary; moderately large; very hairy; and of a blackish, or dusky colour, rufous beneath, with the *three last* segments rust coloured. The chrysalis is *of a blackish cast.*



85.

THE HEBE MOTH.

Phalæna Hebe.—GERMANY.



86.

THE BROAD BORDERED YELLOW UNDER-WING MOTH.
Phalæna Fimbria.—BRITAIN.

THE BROAD BORDERED YELLOW UNDER-WING MOTH.

Phalæna Fimbria.

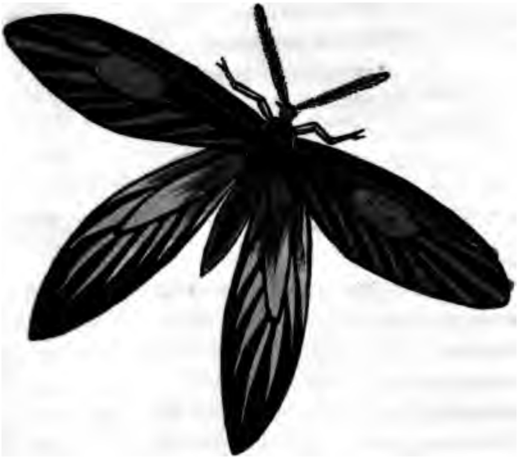
PLATE LXXXVI.

Phalæna Fimbria, *Turton's Linné*, iii. p. 296.—*Linn. Syst. Nat.* ii. p. 842.—*Fab. Ent. Syst.* iii. p. 2.

The upper wings are of a high toned buff colour, marked with obscure bands, or streaks; the under wings are reddish orange, with a broad bar of black towards their anal margins, and a border of orange; the thorax, same colour as the upper wings; and the abdomen corresponds with those of the under wings; it has a transverse tail; the antennæ taper from the base to the tips, where they are very slender.

This rare British insect is distinguished from two very common species that are allied to it, by the broad stripe of black on the under wings, as its trivial name implies. In the larva state, it is one of that kind which collectors call under-ground feeders; subsisting chiefly on the roots of grass, and never appearing above ground till the evening, for which reason it is rarely taken by naturalists. It is of a dull brown colour, having a double stripe of white extending from its head to its tail; and each segment is furnished with a brown oblique spot. Before changing into the chrysalis state, it gathers around itself a cluster of small leaves and bits of grass, where it remains till its transformation. The pupa is of a brownish black.

The moth is very delicate in its appearance, and it assumes the imago state in May. Fabricius says it inhabits Germany.



87.

THE RHODOPE MOTH.

Phalæna Rhodope.—China.

THE RHODOPE MOTH.

Phalæna Rhodope.

PLATE LXXXVII.

Phalæna Rhodope, *Fab. Sp. In.* ii. p. 163.—*Cramer, Ins.* pl. 30, fig. E.

THE upper wings are black; and the under wings of a bright blue, radiated with black; the body is black, with a large spot of blue towards its centre; the lower part of the segments of the abdomen are of a bright orange, with square and lanceolate spots on the lower part of the back; the head is orange, and the antennæ long and setaceous.

This remarkable and singularly shaped insect is an inhabitant of China, and is represented on the plate of its natural size.

THE BRIGHT MOTH.

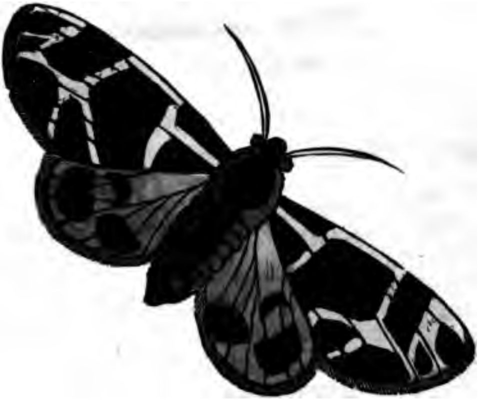
Phalæna Flavia.

PLATE LXXXVIII.

Phalæna Flavia, *Turton's Linné.*

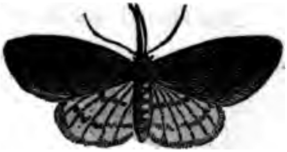
The upper wings are of a rich cream yellow, with large irregular patches of deep black; the lower wings are of a fine brownish orange, gradually becoming lighter as they approach their junction with the body, with three large black patches towards the anal extremity of each; all the exterior and posterior margins are fringed; the antennæ are rather short and tapering; the body is of a deep crimson, as well as the eyes; the back with a large circular black spot, and a narrow longitudinal band along the segments; the tail is deep black.

This very fine moth is a native of the frigid confines of the north, being found chiefly in Siberia, a climate where insect life is extremely limited, owing to the shortness of summer.



88.

THE BRIGHT MOTH.
Phalæna Flavia.—Siberia.



89.

THE SNOUT MOTH.
Phalæna Rostellum—BRITAIN.

THE SNOUT MOTH.

Phalæna Rostellum.

PLATE LXXXIX.

The Snout Moth, *Harris's Aurelian*, p. 86, pl. 43, fig. 6.—Hypena nobocidalis, *Ochsenheimer*, *Rennie's Conspectus of Butterflies*, page 145.

The superior wings of this curious moth are of a deep brown black, with three darker ones crossing them. The lower wings are of a yellow fawn colour, as also the body; the former with two lines crossing each. One of the most peculiar features of this moth is the length of its palpi, which project in the form of a snout. The antennæ are like threads.

The caterpillar of the Snout Moth is of a rich tawny; it feeds upon oaks, and is to be found in October, by beating the trees. They spin themselves a nest in the leaves, being one of the species known by the name of leaf-rolling caterpillars. They change into the chrysalis form in the end of October, and continue in this condition till the following June, when they are transformed into the imago, or perfect moth, which expands about an inch and a half.

THE SMALL TIGER MOTH.

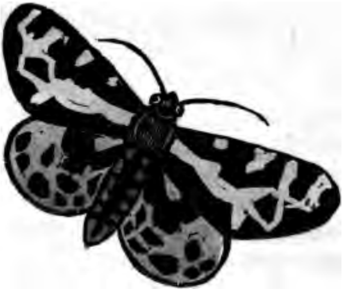
Phalæna Plantagines.

PLATE XC.

Phalæna Plantagines, *Linn. Syst. Nat.* ii. p. 820.—*Wilkes's Pap.* 24, pl. 3, A. 5. *Donovan's Brit. Ins.* pl. 134.

The upper wings are of a reddish cream colour, in some individuals, and of a rich golden yellow in others, clouded with black; the under wings are bright fawn colour, with numerous large variously shaped clouds or patches of black; the thorax and abdomen are crimson, barred with black; having a large black line down the centre of the back; the antennæ are black, and tapering from the base to the tips.

The caterpillar of this species is black, the upper half of it being covered with rather short reddish brown hairs, and the under half with long black recumbent hairs; it feeds on nettles, chickweed, plantain, grass, &c. It very much resembles that of the Large Tiger Moth, (*Phalæna caja,*) except in size; it changes into a chrysalis about the middle of April, and appears in the winged state the latter end of May. The chrysalis is bluish black.



90.

THE SMALL TIGER MOTH.—FEMALE.

Phalæna Plantaginis.—BRITAIN.

This is rather a scarce British lepidoptera, being infinitely more rare than the Ruby Tiger Moth, (*Phalæna fuliginosa,*) and the Great Tiger Moth.

A variety of this species, with crimson under wings, is found in the East Indies and in America. The under wings of the female, in the European specimens, are much redder than those of the male.

THE BLACK AND CREAM SPOTTED MOTH.

Phalæna Atralis.

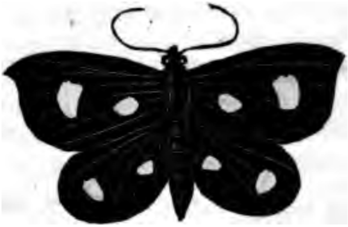
PLATE XCI.

Phalæna Atralis, *Fab. Syst. Ent.* iii. p. 2, 142.—*Donovan's Brit. Ins.* pl. 266, fig. 4.

The wings are black, with two cream coloured spots on each.

Size of the insect, five-eighths of an inch, with extended wings.

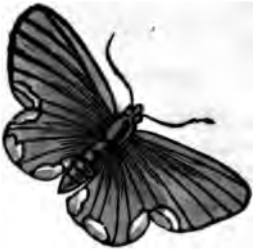
It is said to be found in Germany, and is very rare as a British species, but has been taken on Epping Forest.



91.

THE BLACK AND CREAM SPOTTED MOTH.

Phalæna Atralis.—Britain.



92.

THE MAID OF HONOUR MOTH.

Phalæna Ditaria.—BRITAIN.

THE MAID OF HONOUR MOTH.

Phalæna Ditaria.

PLATE XCII.

Phalæna ditaria, *Fab. Ent. Syst.* iii. p. 2.—*Wein. Vers.* 97. 6.—*Donovan's Brit. Ins.* 1.—*Harris's Cat.* 31. 218. pl. 202.—Cleora Cajularia, *Stephens.*—*Rennie's Conspectus of Butterflies*, p. 110.

The wings of this beautiful insect are one inch one-twelfth, to one-fourth; are bright green, with white spots, having rose-coloured clouds towards their extremities; the fringes are white, spotted with brown; the thorax and abdomen are also of the same colour. The antennæ taper from the base. The caterpillar is gray, and feeds upon the oak.

This appears to be a very local species. It has been found for many years past, in the month of June, near the Oak of Honour, in the neighbourhood of Packham, and likewise in Kent and Surrey.

It is also a continental species, but seems to be very rare, as Fabricius refers to only one author for it. He says that it feeds on the oak.

THE RUBY TIGER MOTH.

Phalæna Fuliginosa.

PLATE XCIII.

Phalæna fuliginosa, *Linn. Syst. Nat.* ii. p. 836.—*Harris's Aurelian*, pl. 12.—*Wilkes's Pap.* iii. a 14.—*Donovan's Brit. Ins.* pl. 80.—Phragmatobia fuliginosa, *Stephens*.—*Rennie's Conspectus of Butterflies*, p. 43.

The superior wings and thorax of this pretty little insect are of a rich reddish brown, with two black spots in the centre; the inferior wings are of a deep rose colour, but not very bright, with a row of large black marks; they are five-sixths to one inch and a half; towards the lower margin the abdomen is rose colour, with a black spot on the centre of each segment behind, and a chain of little black dots down each side.

The upper wings of some specimens have a black spot on each, which varies very much in situation and size; in some it occupies about half the space of the wings, while in others it is entirely wanting.

The caterpillar is of a rich fawn colour, or rusty red, completely covered with long hairs, with a black head, and is large in proportion to the size of the Moth; the fore-legs are also black. The leaves

93.

THE RUBY TIGER MOTH.
Phalæna Fuliginosa.—BRITAIN.

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ler or birch, the turnip, mustard, plantain, and ort, with many other vegetables, are noticed lifferent authors, as being proper food for the y Tiger Moth in the larva state; but its most mon food is ragwort and groundsel. The cater-ars are small in the month of May; in June ey pass to the pupa condition, and early in July pear in the winged state. The pupa is black, d enveloped in a follicle.

In a forward season, the time of their appearance n different states may vary considerably, especially s some have two, or even three broods in one summer. This insect is a native of Britain, and is usually little more than an inch in breadth, although in this particular it is subject to vary. It is found in Durham, Yorkshire, Hertfordshire, Kent, and Surrey, and near Dublin in Ireland.

THE SMALL MAGPIE MOTH.

Phalæna Urticata.

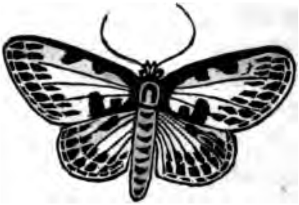
PLATE XCIV.

Phalæna Urticata, *Linn. Syst. Nat.* ii. p. 873.—*Turton's Linné*, iii. p. 269.—*Donovan's Brit. Ins.* pl. 349, fig. 2.—Botys Urticata, *Latreille.*

The head, throat, and abdomen are rich yellow, as is that part of the superior wings near the shoulder; all the wings are white, finely spotted with black.

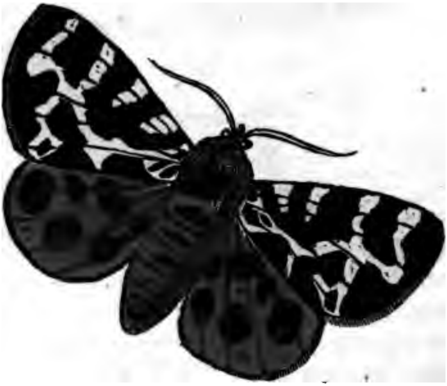
The larva conceals itself in a kind of cylinder, formed by rolling up the edges of nettle leaves, on which it feeds. It is whitish, with a dark dorsal line; head black, and two spots of the same colour on the segment next the head. It continues in this way till the cold weather sets in, when it changes to a red colour, and spins a buff coloured case, through which it may be distinctly seen; in about a month it changes to a yellow colour. In the following May it assumes the chrysalis state, and transforms in June.

This insect is found abundantly near London.



94.

THE SMALL MAGPIE MOTH.
Phalæna Urticata.—BRITAIN.



95.

THE GREAT TIGER MOTH.

Phalæna Caja.—Britain.

THE GREAT TIGER MOTH.

Phalæna Caja.

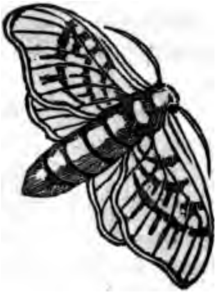
PLATE XCV.

Phalæna Caja, *Linn. Syst. Nat.* ii. p. 819.—*Turton's Linné,* iii. p. 223.—*Donovan's Brit. Ins.* i. pl. 15.—Arctia Caja, *Stephens.*—*Rennie's Conspectus of Butterflies,* p. 42.

The superior wings of the male are two inches two-thirds to eleven-twelfths; and those of the female two inches and three quarters to three inches; they are of a cream colour, with large irregularly shaped black patches, which vary considerably, both in shape and size, and frequently two are united to form one. The inferior wings, and annulations of the body, are of a rich orange, which also admit of equal variety; the spots near the thorax are often united, and the small black stripes on the back are fewer in some specimens than on others; the back and thorax are of a raw umber brown, thickly beset with fine hairs and bristles; under the head is a semilunar stripe of a fine pale crimson.

The caterpillar is solitary; of a high coloured chestnut, sometimes black; thickly covered with long hairs of nearly the same colour; each of the segments are provided with three elevated, bluish warts; these are situated on the sides. It feeds on lettuces, chickweek, and nettles; and when apprehensive of danger, rolls itself up like a hedgehog. It changes into the chrysalis state in May; and the latter end of June, or the beginning of July, is transformed into the perfect moth. The pupa is black, or brown, and enclosed in a case, or follicle.

This moth is to be found abundantly in most places of Great Britain, and may be seen flitting about, where nettles are growing, in the dusk. It makes its appearance about the end of July.



96.

THE SILKWORM MOTH.

Phalæna Mori.—CHINA.

THE SILKWORM MOTH.

Phalæna Mori.

PLATE XCVI.

Phalæna Mori, *Linn. Syst. Nat.* ii. p. 817.—*Turton's Linné*, iii. p. 204.—*Harris's Aurelian*, pl. 13, fig. E. F.—*Albin*, pl. 12, fig. 16.

The Silkworm Moth is of a pale buff colour, having two faint lines crossing the wings, which are slightly bent, or curved at their apices. The figure at Plate XCVI. is about the size of nature.

Pullein, a popular writer, has justly observed, "There is scarcely any thing among the various wonders which the animal creation affords, more admirable than the variety of changes which the Silkworm undergoes; but the curious texture of the silken covering with which it surrounds itself when it arrives at the perfection of its animal life, vastly surpasses what is made by other animals of this class. All the caterpillar kind do, indeed, undergo changes like those of the Silkworm, and the beauty of many of them in their butterfly state greatly exceeds it; but the covering which they put on before this change into a *fly state*, is poor and mean when compared to that golden tissue in which the Silkworm wraps itself. They indeed come forth in a variety of colours, their wings bedropped with gold and scarlet, yet are they but the beings of a summer's day; both their life and beauty quickly vanish, and they leave no remembrance after them; but the Silkworm leaves behind it such beautiful, such beneficial monuments, as at once record both the wisdom of their Creator, and His bounty to man.

The eggs of the Silkworm are about the size of a grain of mustard-seed, of an ovate shape, and depressed in the centre; they are at first of a yellowish colour, but, in three or four days, acquire a bluish cast; they are laid in irregular patches, on the leaves of the mulberry. In this country, the caterpillar is produced in May. When first hatched, it appears like a small black worm, not a quarter of an inch in length: it almost immediately moves about in search of food, at which time it is more vivacious than at any other period, as it is a dull, lifeless animal when full grown, and seldom moves beyond three or four feet during its larva state: hence the ease with which it is managed when cultivated for its silk.

It has sixteen legs, set in pairs; six in front, which are covered with a shell, or scale, are placed under each of the three first annulations next the head, and cannot be altered in their position. The other *ten feet* are termed holders; these are membranaceous, flexible, and provided with small hooks, which assist the animal in climbing.

The following is a figure of the caterpillar, about two-thirds its dimensions when full grown:

The shell is enclosed in a membranaceous substance, similar in consistence to the first six legs. The mouth is vertical, and the jaws serrated like a saw. The animal is furnished with eighteen breathing holes, nine on each side down the body, at equal distances. On each side of the head, near to the mouth, seven eyes may be discovered by the aid of a lens. The two circular protuberances higher up the head, which look very like eyes, are simply bones of the skull. The spinning apparatus is similar to that described at page 68 of this volume.

When the worm becomes satiated with eating, it then prepares for its change into the chrysalis condition. The worm now fixes upon an angle, or hollow place, whose dimensions agree with the size of its intended cocoon, and begins its task by spinning thin and irregular threads, which are for the support of its future dwelling. The first day's labour consists in forming a loose structure, of an oval shape, which is termed floss silk, and within this *covering, in the* three following days, it works the firm and consistent yellow ball; the labour always, of course, remaining within the sphere of the cone which it is forming.

If at any time the threads intended for the support of the cocoon should be broken, the ball not being properly poised, becomes unsteady, so that the insect is unable perfectly to go forward with its labours. Under these circumstances, the worm pierces a hole in, and altogether abandons the unfinished cocoons, and throws out its remaining threads at random wherever it passes, by which means the silk is wholly lost, and the caterpillar, finding no place wherein to prepare for its change, dies without having effected it.

At the end of the third or fourth day, the worm generally completes its task, and has formed its cocoon, which, in size and shape, is like that of a pigeon's egg. It is, however, but seldom that it attains so large a size. The following figure represents the cocoon upwards of two-thirds the usual size, with part of the floss silk removed:

The operation of spinning, and the emission of so large a quantity of silk, uncompensated by food, causes the worm gradually to contract in bulk; it becomes shrivelled, and the wings of its body approach nearer to each other, and their articulations become more distinctly marked. When the cocoon is completed, the larva rests from its toil, then throws off its caterpillar garb, and changes into the chrysalis state, in which condition it is somewhat like a kidney bean, having a smooth brown skin. The following is a figure of the chrysalis:

The Silkworm remains in its pupa state for periods depending on the climate or temperature wherein it is placed, varying from fifteen to thirty days; it then throws off its shroud, and appears in the perfect, or imago state. The moth enjoys its liberty but for a very short space of time. Its first object is to seek its mate, after which the female deposits her eggs, and both male and female die in a few days thereafter.

It is certainly curious to reflect, how this animal should enjoy so short an existence in its perfect condition; for by far the longest period of its life is in its caterpillar state. A complete suspension of its animal faculties takes place when it changes to a chrysalis; and when it emerges from this state, the whole business of its life is the continuation of its species. It does not even enjoy the grateful *pleasure of food.*

The following represents the female Silkw Moth, about two-thirds of the size of life, in act of laying her eggs:

The number produced by one female is vari stated. Some accounts mention 250, while o reckon 400 to 500 as the usual number.

One of the most astonishing circumstances nected with the natural history of Silkworm the degree in which their bulk and length ar creased, and the very limited time in which th accomplished. Count Dandolo counted and wei many a hundred thousand eggs, and found on an average, sixty-eight sound Silkworm's weighed one grain. One ounce,* therefore, prised 39,168 eggs. But one-twelfth part of weight evaporates previous to hatching, and the skins in which they are contained are equal to one-fifth more. If, therefore, from one ounce composed of 576 grains, 48 grains be deducted for evaporation, and 115 for the shells, 413 grains will remain equal to the weight of 39,168 young worms; and according to this computation, 54,526 of the larvæ, when newly hatched, are required to make up an ounce. After they part with their first skin, 3840 worms are found to be this weight, so that the bulk and weight of the insects have, in a few days, been multiplied more than fourteen times. After the second change, 610 larvæ weigh an ounce, the weight of the animals being increased, in the intermediate time, six-fold. In the week passed between the second and third ages, the number of worms required to make up the weight decreases from 610 to 144, their weight being, therefore, more than quadrupled. During the fourth age, a similar rate of increase is maintained; thirty-five worms now weigh an ounce. The fifth age of the caterpillar comprises nearly a third part of its brief existence, and has been described by an enthusiastic writer on the subject as the happiest period of its life, during which it rapidly increases in size, and prepares and secretes the material which it is about to spin. When the Silkworms are fully grown, and have arrived at that period when they finally reject food, six of them make up the weight of an ounce.

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* This ounce contains 576 grains; 8.5325 of these equal seven grains troy. One ounce avoirdupois is the equal to about 533 of these grains, and between one-tw *and one-thirteenth* ounce avoirdupois equals one of the *ounces.*

They have, therefore, since their last change, again added to their weight six-fold. Thus it will be seen that the insect has multiplied its weight more than *nine thousand* fold.

It is worthy of remark, that, when the moth has assumed its perfect state, it does not think of using its wings like other winged insects, for it never betakes itself to aërial excursions, and seldom moves beyond a few inches from the spot where it was hatched.

It will be readily imagined, that this remarkable insect occupies a place in our volume, not from personal beauty, but from the importance of its labours in a mercantile point of view, and its utility to mankind.

THE EARLY HISTORY OF SILK.

THE period when mankind first discovered that the ball which contains the chrysalis of the Silkworm Moth might be converted into a texture so beautiful, is hidden by the cloud of antiquity. Nor is it possible to trace the progressive steps by which the high state of excellence of the different kinds of manufacture of this substance has been attained. But it seems certain that the invention of converting the silky filaments into various fabrics is due to the Chinese.

If we go back as far as the oldest histories lead us, we find that the Chinese had acquired a degree of excellence in various manufactures, which they have yet hardly improved upon, and equal to what has been attained in the most civilized nations of Europe. This is especially applicable to silk, colours, and sugar. And, like other Eastern nations, they have made no changes in their modes of manufacture, nor in the simple and rude structure of their machinery, while other countries have made gigantic strides towards perfection.

The archives of China record the use of silk in that country 2700 years before the Christian era. The Empress See-linng-skee, consort of Hoang-tee, is said to have been the discoverer of the winding of silk from the cocoon, and of converting the silky filaments into a tissue.

So abundant was it in China long before the Christian era, that in provinces of that country, the peasantry, amounting in numbers to millions, were attired in silk dresses.

Silk was manufactured at Kos, an island of the Archipelago, in very remote ages. It is related by Aristotle, that Pamphila, a noble lady of that island, was inventress of a superior mode of fabricating a tissue from wove silk, which she undid, re-spun, and re-wove, with the assistance of the females of her household. This manufacture was known by the name of *Bombykia,* from the word *Bombyx,* a silkworm. It certainly was a singular fancy to undo finished fabrics, to apply their threads to a new species of manufacture. But it would appear to have been excellent of its kind; for it is recorded, that the Roman ladies afterwards adopted the process invented by Pamphila.

From the manufacture having emanated from Kos, *Pliny* formed the notion that the Silkworm Moth was a native of that island, which subsequent history contradicts. There remains but little doubt that, whatever fabrics were there wove from raw silk, that it was the produce of Eastern countries, as was the case with stuffs woven at Tyre, Berytus, and Persia. This seems beyond a doubt; for the historians Zonaras and Theophanes say, that before the introduction of Silkworms into Constantinople, in the middle of the sixth century, nobody in that city was aware that silk was the produce of caterpillars.

In the enumeration of the articles mentioned in the embellishment of Solomon's Temple, we are expressly told of fine linen, but no mention whatever is made of silk, which could not fail to have been noticed had it been then in use; nor did it seem to be known even after the rebuilding of the Temple, as it is not recorded amongst its decorations. It, however, is mentioned as an article of trade in Jerome's translation of the Bible, where it is said to have been sent from Syria to Tyre, 588 years before the time of Christ. It must then have been a rare article, as the building of the Temple was completed only sixty-four years before that period.

Alexander the Great—who, along with his ambitious desires, united much zeal in extending useful arts throughout his dominions, most probably imbibed from his great instructor Aristotle, who prompted him to explore the great field of nature

—took care to bring with him, after his victories, from Persia, great quantities of manufactured silks.

The description of the Silkworm given by Aristotle, is the most distinct of all handed down to us by the ancient writers: he details minutely the different transformations, but makes no mention of the country of which the insect was a native.

Much discrepancy prevails among the ancients as to the country from whence the Silkworm was brought. Pliny says, that it was on the island of Kos, on the opposite side of the Ægean Sea, not far from the coast of Attica, where Pamphila and her nymphs made the tissue so much admired; which might be the means of leading them into this error.

It is a remarkable fact, that many authors, for the long space of nine hundred years after the time of Aristotle, asserted that sericum, or silk, was either made from a fleecy substance growing upon trees, from the coir, or inner bark of trees, or from flowers; all these opinions, no doubt, arising from the indistinct accounts which they must have heard of Silkworm larvæ feeding on the leaves of the mulberry-tree, mixed up with accounts which had reached them of flax and cotton being produced from vegetable substances. Some authors, however, asserted that it was produced from the filaments of *a spider* or beetle.

It is true that, in those remote times, before the invention of printing, discoveries found their way from one country to another by slow and uncertain degrees; so much so, that even men of the greatest learning and information were long of becoming acquainted with established facts. It may appear strange that the learned Isidorus, bishop of Hiopolis, in Spain, was unacquainted with the history of the Silkworm, although he wrote a century after its introduction into Europe; for we find him copying the account of that animal from Pliny.

Silk was exceedingly scanty in Europe till the reign of Augustus Cæsar, and continued long after to be a costly and rare commodity.

We are informed that, in the reign of Tiberius, Eastern silk was forbidden to be worn by any one but women of rank; and a law was passed, prohibiting the use of it by males. A cheaper material was invented for people of inferior rank, made of a mixture of silk, with some other more common substance. This species of cloth was called *sub-sericum*, and became a favourite costume with both sexes. As Rome improved in wealth, and luxury followed in its train, the demand for silk became so excessive, that it reached a very high price; so much so, that Marc Antony sent ambassadors to China to open a more direct commercial treaty with that country, to supply the demand, and reduce the price of the article. This embassy turned out like most others to that jealous people, without attainin view; so that, for several centuries, P the medium of communication betwee Rome.

In the third century, the profligate] had an upper garment made entirely of in the end of that century, the Emper who was famous for his economy an refused the entreaties of his empress, sirous of possessing a robe of silk, all excuse, that it could only be obtained in gold.

Persia continued long to reap the commerce of silk, which, for the tw centuries, continued in high demand rious Romans.

The Romans having commenced hosti the Persians, in the reign of the Emper that monarch tried to procure for his sub luxuries, through the medium of Ela of Axuma, and of Homerites, govern Felix. But these princes wanted enterp them properly to fulfil their commer ments, which caused the price of silk to in Constantinople, that few could affor so costly an article. In this state of Phœnicians were anxious to continue t of silken fabrics, but the impolitic rap Emperor Justinian nearly ruined the t posing high duties on the article, and by the still more arbitrary decree of regulating the price at which the merchants were to sell the commodity. By these measures the price was fixed at a sum equal to £.4 : 15 : 9 English money, or estimated at its weight in gold for the pound avoirdupois, which is much beyond its value at the present time. The rigid manner in which this duty was exacted, com pletely ruined the silk merchants at Constantinople, and what the Emperor intended as an addition to his revenue, turned out very much the reverse.

At this critical period for the silk trade of the Romans, an unexpected circumstance brought about a new era. Cosmus tells us that there were several Christian churches established in various parts of India, and that two monks, employed as missionaries from some of these, found access to the country of the Seres, or China. There, amidst their pious occupations, they viewed with a curious eye the common dress of the Chinese, the manufactures of silk, and the myriads of Silkworms, whose education, either on trees or in houses, had once been considered the labour of queens. They soon discovered that it was impracticable to transplant the short-lived insect, but that in the eggs a numerous progeny might be preserved.* They studied deeply the process of the different manufactures, and the habits of the animal. On their return, they d municate their information to their ow men, but bent their way to Constantin they made known to the Emperor Ju habits and economy of this curious ins veloped the Chinese system of making fabrics.

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* *ROBERTSON'S Disquisition on the* Commerce of India.

At that period they were in entire ign what it was produced; some, however, was the intestines of a spider-like insec with eight legs, which was for four year paste, and afterwards on the leaves o green willow, till it burst from over feed says, silk was the produce of a worm w nests of clay, and collected wax.† An approaching nearer the truth, says it i from the pupa of a caterpillar with horns he does not expressly say the pupa, ye inferred; but it could not be the cor worm, (*Phalæna mori,*) which he m mentions two characters irreconcilable wi ly, that of having horns, and being of a

Stimulated by offers of a great reward, retraced their steps to China, where th to possess themselves of a quantity of the Silkworm Moth, which they con hollow cane, and brought safely to Con in the year 552. These eggs were hatched in due season, by the aid of manure, and the larvæ fed on mulberry leaves. The caterpillars duly commenced the operations of spinning their cocoons, and, under the superintendence of the monks, successfully bred, and multiplied to a great extent. Afterwards, these monks instructed the Romans in the whole mystery of this propagation, and the methods employed by the Chinese in manufacturing fabrics from the exquisitely fine filaments spun by the little caterpillars.*

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* Pausanias, vi. 80.

† Hist. Nat. l.

From the caneful of eggs, thus surreptitiously acquired, have sprung all the Silkworms which are now to be found in almost every country of Western Asia and the South of Europe. These are daily multiplying, and up to the present time, an immensely increased demand for silk has been felt all over the civilized globe; and an immoral act, which was prompted by the avarice of one man, has proved a blessing to countless thousands, by affording them employment, and a suitable reward for their industry.

The manufacture of silk at Rome was for a considerable time conducted under the care of the treasurer of the rapacious Justinian, who had secret places for carrying on the monopoly; and the monks instructed weavers, which the Emperor brought from Berytus and Tyre, in the Chinese method of making fabrics. Silks of the imperial manufacture sold prodigiously high, and far exceeded even the exorbitant prices formerly fixed by the Emperor on foreign commodities ; so that the price of silk per pound was now six pieces of gold, being eight times more costly than before the introduction of the insect into Rome. This was the value of common colours, for the imperial purple was quadruple that price ; so that the propagating of the animal, which, in other circumstances, and under a patriotic sovereign, might have been a boon to the empire, proved, under the sordid Justinian, rather a curse.

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* *Procopius, de Bello* Gothico, lib. iv. c. 17.

Things, however, could not long remain in this state, for ways and means were found to convey the Silkworm Moth to Greece and the Peloponnesus, in whose genial climates they quickly increased ; and the sovereigns of these states, actuated by more generous views, multiplied the growth of mulberry-trees, extended the manufacture of silk, and soon rendered their empire independent of those supplies which they obtained through their mercantile intercourse with Persia.

In the middle of the sixth century the Turks established themselves in Asia, and their frequent subsequent wars had tended greatly to impede the traffic carried on betwixt China and Persia, through the caravans, consequently, silk in Persia had assumed a high value from its scarcity.

After the establishment of the peace, Maniak, a prince of Sogdia, through the wishes of his people, was appointed ambassador by the Turkish court, to mediate with Persia for supplying that nation with Eastern silk. This prince acted in the twofold capacity of an envoy and a merchant. He took with him to Persia a number of bales of the manufactured silk, which he expected to sell readily, in consequence of the price at which he could afford to dispose of them being so much lower than in Persia at the time. But the results of this embassy proved different to what the Sogdian prince expected.

At this time Persia was under the sway of Chosroes, a king, who, to a love for his people, united soundness of policy. He wisely saw that it would tend to no good to increase the wealth of a prince whose territories lay so close to his own, and who had been actuated by schemes of ambition. To show, therefore, his contempt for the merchandise of the Sogdian prince and his mercantile followers, he purchased up all their goods, and to prove how little he valued them, committed the whole to the flames. Besides the motives above stated, he considered it would be more for the advantage of his people to carry on a direct traffic with China through the Gulf of Persia. In the furtherance of these views, an alliance was entered into between the Persians and Chinese, to the exclusion of the Turks, who, in their turn, sought the aid of the Romans. They *again appointed* Maniak as envoy to Persia, but that prince had the mortification to find, at Co stantinople, not only the Silkworm feeding healthful vigour, but also extensive manufactor established for weaving different fabrics. He, ho ever, had the address to conceal the chagrin he m have experienced, and, even with a degree of fl tery, corresponding to that of a more civili prince in modern times, complimented the Rom on the progress they had made, and assured th their manufactories were equal in quality to th of China, and their management and culture of worms were not less successful.*

Although the culture of these insects turned as successful as possible, still a considerable num of years elapsed before silk became a cheap arti As a proof of this, we find, that, in the year 7 the Emperor Charlemagne considered silk as a worthy of royalty, for he presented Offa, King Mercia, with two vests made of that substance.

About this time the Venetians opened a comm cial treaty with the Greeks, for the purpose supplying the west of Europe with silks, the ma facture of that nation.

It was well for Europe that the Silkworm been so successfully introduced as to render importation of Chinese silk unnecessary. Fo circumstance occurred in the year 877, which for a time completely put a stop to the manufacture of silk in China. Biacha, a desperate insurgent, seized the reins of the Chinese empire, put to death all the foreign merchants of Canfu, and directed that the whole mulberry-trees on which the larvæ of the Silkworm Moth were fed should be cut down, so that there was not a particle of silk produced during his reign.

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* *See* GIBBON's *Decline and Fall of the Roman Em chap. xiii.*

Massoudi informs us that Canfu, in the year 988, was again the resort of Arabian merchants, and also of trading vessels from India.

The Roman empire began to decline about the year 1146, yet that enterprising people still maintained their superiority in the manufacture of silken stuffs of various kinds; having been the sole possessors in Europe of the Silkworm for a period of more than six hundred years.

THE HISTORY OF SILK DUR MIDDLE AGES.

THE culture of the Silkworm Moth an object of universal attraction, an hardly a nation at all civilized which to participate in the benefits which from so important an acquisition.

Roger the First, King of Sicily, havi against the Grecian empire, and success her territories, carried off as plunder able wealth of Corinth, Thebes, and having seized the persons of many expert weavers of silk, brought the Palermo, where he established a man compelled these unfortunate men to m him the secrets of the art.

Here we have another instance of from evil; for from these unoffending *were* wantonly torn from the bosom of *and their* country, the general diss knowledge of this important trade found its way through all parts of Europe. We have seen that, for the long period of six hundred years, this manufacture was confined to the Roman power, and carefully kept secret from neighbouring states.

In the short period of twenty years, we are informed that the Sicilians had attained a much higher degree of perfection in the manufacture of silk than the Greeks, both as to splendour and diversity of the patterns, and the brilliancy of the colours. They introduced into different textures golden threads, wrought into fanciful figures; and in other fabrics, pearls were intermingled. From this period may be dated a decided improvement in the national character and prosperity of that kingdom, which now became the centre of attraction to the whole western hemisphere. It now began to spread itself all over Italy, where it became an article of great commercial importance, and continues to this day a staple commodity.*

It is quite certain, that in the year 1306, the progress of rearing Silkworms had arrived at such a pitch in Modena, that the manufacture of silk contributed largely to the revenue of the state, and was considered the best which was made in Lombardy. Whether to augment the revenue, or to

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* *Otho Friesing, De Gest. Frederici.* l. i. cap. 33.

increase this manufacture, is not kr
edict was passed, obliging every pers
an enclosure to plant at least three m
and compelling the cocoons produced
worms to be sold in the public mark
exacted both from the seller and purc

Notwithstanding the high perfectio
nese in weaving silk, yet they were n
any throwing mills, and were, in
obliged to send all their raw silk to I
thrown, being the only place in Italy
were mills for that purpose.

From Italy Silkworms were in
Spain, where they made but little p
to the unsettled and idle habits of th
appear to have preferred purchasing s
foreign market, rather than entering
the manufacture themselves.

It is quite uncertain when the us
introduced into England, but it appear
of a date considerably subsequent to i
mon in France. But circumstances l
that it must have been shortly after
Conquest. The Chronicles, howeve
that silk was pretty generally adopted
nobility both of England and Scotlan
1251. At this time, Alexander the
land married Margaret, daughter o

Third of England, on which occasion the princess had in attendance a thousand knights dressed in cointises of silk.

After this period, however, silk seems to have been less frequently worn in Britain, but from what cause we can find no account.

Florence had attained a high degree of excellence in silken fabrics so early as the year 1300, at which time many thousands of people were employed in this art.

Venice in its turn became famous for silks, the manufacture of which was considered a fitting employment for nobility, who thought it no disgrace to assist in producing this elegant article of dress. This policy is quite at variance with the modern ideas of the European aristocracy, who consider all employments, save war, the church, and law, as degrading to their rank.

About this time the whole of the Christians were expelled from Syria, by which the Egyptian rulers contrived to make that country the medium through which all the silk imported westward must pass. By this means they added a great revenue to the state, by the exaction of heavy duties, which were severely felt by the Italians and other nations who used foreign silk. This excited the indignation of a learned and noble Venetian named Marino Sanuto, who wrote a book on the subject in the year 1321, and addressed it to the Pope. It bore the fanciful

title of "Secrets of the Faithful," in which he wished to instigate the holy father to suppress these grievous exactions by hostile measures, and recommended, as a prudent step, that his countrymen should forbear using Chinese silks, averring that the quantity produced in Crete, Sicily, Romania, Apulia, and Cyprus, would be sufficient, if attention were directed to the extended propagation of the worms
He implores all true Christians to abstain from th
purchase of any silk merely suspected to have co
through the hands of these infidels. He rec
mended the establishment of galleys to inter
smuggling.

So rare were silks in the reign of Edward VI
Sir Thomas Gresham presented that monarc
a pair of Spanish long silk hose, which th
considered as a high compliment, from their
and that extravagant king, Henry VIII,
wore silk stockings except upon great occas
these he procured from Spain. Queen
in the third year of her reign, (1560,) was
by her silk woman, Mrs Montague, wit
silk stockings, which so greatly delighte
she never afterwards wore cloth hose.
not find that the manufacture made
during her reign.

By slow degrees part of Spain had
considerable reputation for different
and manufactories of some conse

erected, particularly in the province of Granada, then under the dominion of a Moorish prince.

In France, the silk trade experienced a considerable improvement during the reign of Francis I. At that period Milan was under his yoke, and from thence he carried weavers to Lyons, and cherished by all means the progress of the trade. This gave a spirit to the manufacture, and was the means of spreading a taste for it in several of the neighbouring provinces. And so rapidly did these arts improve and extend, that they soon were enabled to export to England and other countries great quantities of their silken goods.

Some historians say, that the Silkworm was introduced into France in the reign of Charles VIII, at so early a period as the fifteenth century, by some of his noble followers in his Italian campaign; while others assert that it was brought from Sicily. It seems quite certain that the mulberry-tree was first introduced from the latter country, and that the Silkworm Moth was not propagated in Provence till the reign of Henry IV, whose anxiety to establish the insect more generally, prompted him to make extensive nurseries of mulberry plants, and he gave them gratis to every one desirous of possessing them.

It appeared to him, that as mulberry-trees were plentiful in his kingdom, he might render an essential benefit to his people by the propagation o insect which was of such great commercial im ance to other states. It is a curious fact, that S whom the king generally consulted on any im ant measure, used all his eloquence to diss him against the measure, who, in opposition t opinion which he generally respected, importe insect, which throve amazingly, and the result soon crowned by a successful and beneficial blishment of numerous silk manufactories in ferent provinces throughout the kingdom.

The increase of demand for silks in Eng attracted the attention of Queen Mary, and, to c the pride of the citizens, which appeared to h too aspiring, she, in the year 1554, enacted, “ whoever shall wear silk in or upon his or her bonnet, or girdle, scabbard, hose, shoes, or leather, shall be imprisoned during three mo and forfeit ten pounds.” Magistrates of corpora and esquires were exempt from the penalties o statute.

During the reign of James I. of Scotland, sil a very rare article in his kingdom; for we are that that monarch had not a pair of silk stockin his possession when he was to receive the En ambassador, and had to apply to a subject, w appears, was better provided, for the loan of a *This* was the Earl of Mar, to whom the king *in* an impressive manner, “You would not, that your king should appear as a scrub before strangers."

Antwerp, which was long the great mart for silk, and the produce of almost all nations, was taken by the Duke of Parma in 1585, and given up to be plundered by his army for three days. This disastrous event proved the destruction of the commerce of the Netherlands. The splendid manufactures of Brabant and Flanders were annihilated, and the artisans dispersed and took refuge in foreign states; nearly a third of them found their way to Britain, and laid the foundation of those manufactories which are now an honour to the land. It was long, however, before the goods of our own country were much noticed, the preference being given to those of foreign manufacture. So completely were our own fabrics neglected in the year 1668, that it led almost to a total ruin of the trade, nothing pleasing our families but French goods; and the merchants said at the time, that the women's hats were turned into hoods made of French silk, whereby every maid-servant became a standing revenue to the French king of half her wages.

THE MODERN HISTORY OF SILK.

FEW articles of commerce are more valuable mankind than silk. It is extensively cultivated many of the most populous provinces of southe Europe, and excites as deep an interest among t inhabitants as the crops of flax, hemp, and ev grain in the northern countries. The prospect of failure creates a panic nearly as great as the pr spect of a famine.

In its first production, silk furnishes employme to many thousands, and nearly as great a number its transportation to foreign lands. In the course its being manufactured, it furnishes employment a subsistence to hundreds of thousands, and, besid gives an impulse to the circulating medium of almo all countries, probably in greater degree than almo any other mercantile traffic.

It is not to Europe alone that this valuab article is of such momentous interest, for, in Chi and India, silk is cultivated to a still greater ext than in Europe, and with more success, as the climate of those regions is more congenial to the energies of the insect which produces it. And, moreover, we have seen that it has been an article of dress in these countries from time immemorial, whereas, in Europe, its introduction is comparatively of modern date.

At the end of the sixteenth century, an absurd prejudice continued to prevail in England against our own silken fabrics; but still the manufacture of it was steadily pursued, and the texture gradually improved. At this time, the Rev. William Lea, of St John's College, Cambridge, invented a machine for weaving stockings, which was the first means of setting aside the uncomfortable and unshapely hose which were generally worn at that period. The superiority of these soon attracted universal attention, not only at home, but also abroad; and silk stockings wrought on these machines were eagerly sought after in Italy and other continental states. Great quantities were exported to Italy, where they long maintained a high character for superiority. Keyslar informs us, that, "at Naples, when a tradesman would highly recommend his silk stockings, he protests they are right English." *

Mr Lea, like many other men of genius, whose inventions have benefited mankind, did not meet

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* *Travels through Europe* in the year 1730.

with the encouragement, in England, w important discovery merited. That en monarch, Henry IV. of France, hearin machine, and of the neglect of it by the invited Mr Lea to settle in his country, an him of his countenace and support. He ac accepted the invitation, and, accompani number of journeymen weavers, passed Rouen in Normandy, where he established factory of silk stockings. The troubles i which followed the assassination of Henry I him to abandon his enterprise, and, findin to Paris, in hopes of some encouragement, he was disappointed, he died in abject des

Henry IV. considered the introduction o trade of such consequence, that he stimu Parisians, and others of his subjects, to cu by every means; and even the rank of nob given, as a reward, to those who might b maintain successfully for twelve years facture of silk, from the produce of worm France. This had the effect of produci emulation, and the trade assumed a very ing condition. He caused many mulberr be planted in the vicinity of Paris, and e Silkworms at the Tuilleries, Fountainbl the Castle of Madrid. The king had p made the same efforts to propagate th and planted the mulberry at Provence, Languedoc, Vivarais, Gascony, Saintonage, and Dauphine; and subsequently tried almost every other part of his kingdom. But experience taught him, that the Silkworm could not be successfully propagated north of the river Loire.

In the reign of Louis XIV, Colbert, minister of that monarch, evinced such anxiety for the extension of the silk trade, that he not only gratuitously supplied the possessors of land with mulberry-trees, but also caused them to be transplanted at the expense of the government. This did not, however, facilitate the progress of the culture of silk; for the trees, so easily acquired, were little valued, and even wasted by the peasantry. The minister, finding his views frustrated, adopted another premium for encouraging the growth of the mulberry. He gave, for every tree which presented a thriving condition three years after it was planted, the sum of three livres.

King James I. of England, seeing the benefits which accrued to the French people through the zeal of their sovereign, resolved on adopting similar measures for encouraging the growth of mulberry-trees, and multiplying the breed of Silkworms. In the year 1608, his majesty caused a circular to be addressed to all the counties of his realm, recommending, in the strongest terms, the planting of mulberry-trees, advising all who had the means to purchase in London ten thousand plants, which were then selling at three farthings. But it was not till it was generally known what advantages had been reaped by the French, and other continental kingdoms, in this trade, that the rich generally adopted the recommendations of their sovereign. So averse were our countrymen to exert themselves in this lucrative trade, that it was nearly twelve years before a taste for the manufacture was matured. At length every effort was used, but in vain, to extend the numbers of Silkworms. When it was discovered that the climate of Britain was not congenial to the propagation of the insect, the hopes that were entertained soon began to die away, and in a few years the experiment was in a manner abandoned as hopeless.

The king, finding his projects frustrated at home, now turned his thoughts to his colonies; and he was advised, that the climate of Virginia was of such a temperature, that the insect might there be successfully cultivated. He wrote the Virginian Company a very particular letter on the subject, recommending that they should substitute the cultivation of mulberry-trees, and rearing of Silkworms, for the growth of tobacco, which he considered a "pernicious and offensive weed."

The Virginian Company entered heartily into the king's views; and being furnished with a work written by one of the Company, Mr John Bonoeil, on the Culture of the Silkworm, they entertained notions that they would speedily be enabled to produce such a quantity of silk, that they could supply the half of the world. But a series of untoward events frustrated the hopes of the Company, which was soon after broken up by the misfortunes that befel the colony. And although a subsequent attempt was again made in 1654 by the Virginians, at the instigation of Mr Edward Diggs, yet, from some cause with which we are unacquainted, the silk trade never flourished in that state.

In the year 1629, King Charles I. made an attempt to revive the produce of Silkworms in England, by granting to Walter Aston the keeping of the garden, which had been established near St James's, in the county of Middlesex, for the rearing of Silkworms, which had still been partially maintained. This attempt was again rendered abortive, from cold seasons and other causes.

The rearing of the Worm seems to have been in a dormant state, from the above period, for nearly ninety years, when King George I. granted a patent to John Appleton, for the producing of raw silk in England. This gentleman was to raise the funds necessary for the purpose, by a joint stock concern, the capital of which was to be divided into five pound shares. A lease of Chelsea Park was obtained for the period of one hundred and twenty-two years, and two thousand mulberry-trees were planted, as a small portion of what was ultimately intended. Various large factories were built; but this great establishment was soon abandoned, and the experiment proved as unsuccessful as the previous ones made to raise the Silkworm in this country. The highest expectations were conceived of this project, and Henry Barham, a shareholder, wrote and published an essay, wherein he attempted to show, that all the former attempts had been rendered abortive from mismanagement; and gave it as his opinion, the the objections then thrown out, as to the ultima success of "this glorious undertaking," were worthy of refutation.

King George looked with a favourable eye tow the encouragement of the breeding of Silkwo and on the establishment of the colony of Ge in 1732, he directed that a piece of ground be set apart for propagating the white mulberr the settlers were induced to rear Silkwo which they were pretty successful, and als quantity of silk produced. From Georgia ing of these insects found its way into th bouring state of South Carolina, where it became an article of some commercial int

In the succeeding reign, the governme if possible, to render England independe supplies of silk, endeavoured to encou duction of it in our colonies. For the this object, an act of parliament was year 1749, for the purpose of encourag of silk in the colonies; and a prov was to exempt from duty, on entering the port of London, all silk the produce of Carolina and Georgia. Under such favourable circumstances, these colonies greatly extended their culture of this article; and the government entertained sanguine hopes of their protection of the trade proving ultimately a source which would supply all the demands of the British silk-weavers, if still farther encouragement were afforded to the colonies in question. With this view, Mr Ortolengi, an Italian, well accquainted with the management of the worms, and every other department of the raw silk trade, was engaged to instruct the Georgians in the modes so successfully practised in his native country. This scheme was at first attended with considerable success, and the hopes of the colonists were considerably elevated. But, alas, how uncertain are human affairs! for several seasons followed in succession unfavourable to the silkworms; and this, with the indifferent quality of the silk, and government reducing the bounty, proved a death-blow to the flattering prospects of the Georgians and Carolineans, and the principal planters abandoned the culture of the Silkworm in despair. By the end of the eighteenth century, the Silkworm was unknown in these colonies.

The manufacture of silk was introduced into England in the fifteenth century. Its early progress was, however, far from being rapid; but it gradually increased, according as the growing wealth of the country occasioned a greater demand for silk goods. The silk throwsters of the metropolis were united in a fellowship in the year 1562, and were incorporated by royal charter in 1629. So prosperous and flourishing had their business become, that it is stated, in the preamble to a statute passed in 1666, (13 and 14 of Charles II, cap. 15,) that they had at that time no fewer than *forty thousand* individuals in their employment! And it is of importance to observe, that though the importation of silk goods from foreign countries was occasionally prohibited during the reigns of James I, and Charles I, the Protectorate, and the reign of Charles II, the prohibition was not strictly enforced; and, generally speaking, the importation of these goods was quite free.

A considerable stimulus, though not nearly so great as has been commonly supposed, was given to the English silk manufacture by the revocation of the edict of Nantes, in 1685. Louis XIV. drove, by that intolerant and disgraceful measure, several hundred thousands of his most industrious subjects to seek an asylum in foreign countries; of whom, it is supposed, about fifty thousand came to England. Such of these refugees as had been engaged in the silk manufacture, several branches of which were then in a comparatively advanced state in France, established themselves in Spitalfields, which has continued ever since the principal seat of the British manufacture. At the period of the influx of the refugees, foreign silks were freely admitted into England; and it is stated, in the custom-house returns, that from £.600,000 to £.700,000 worth were annually imported in the interval from 1685 to 1693. But the manufacture was not long permitted to continue on this footing. In 1692, the refugees, who seem to have been quite as conversant with the arts of monopoly as with those either of spinning or weaving, obtained a patent, giving them an exclusive right to manufacture lutestrings and à-la-modes, the silks then in greatest demand. This, however, was not enough to satisfy them; for, in 1697, Parliament passed an act, in compliance with their urgent solicitations, prohibiting the importation of all French and other European silk goods; and, in 1701, the same prohibition was extended to silk goods imported from India and China.

The year 1719 is an important epoch in the history of the British silk manufacture, a patent having been then granted, for fourteen years, to Sir Thomas Lambe and his brother, for an exclusive property of the famous silk mill erected by them at Derby, from models they had clandestinely obtained in Italy, for preparing thrown, or, as it is more commonly called, *organzine* silk. At the expiration of the patent, Parliament refused the prayer of a petition of Sir Thomas Lambe for its renewal, but granted him a *sum of £.14,000* sterling, in consideration of the services he had rendered the country, in erecting a machine which was supposed would very soon have the effect to enable us to dispense wholly with the supplies of thrown silk we had previously been in the habit of importing from Italy. But, instead of being any real advantage, it is most certainly true, that the establishment of throwing mills in England has proved one of the most formidable obstacles to the extension of the silk manufacture. These mills were originally constructed in consequence of the heavy duties laid upon thrown, or organzine, silk; and the circumstance of their having been erected, and a large amount of capital invested in them, has been urged, and, till lately, with success, as a reason for continuing these high duties.

From this period the manufacture advanced gradually, though slowly, until about 1785, or 1790, when the general substitution of cottons for silk, in articles of dress and furniture, gave it a check from which it did not recover for some years. So rapid was the change of fashion, that, in Spitalfields alone, about four thousand looms were shut up in 1793; which, when in full work, seven years before, had given employment to about ten thousand persons.

The trade experienced an evident revival between the years 1798 and 1800, and has made an astonishing progress within the last fifteen or twenty years. This has been, in no inconsiderable degree, owing to the facility with which increased supplies of raw silk are now obtained from India. In 1770, the East India Company began to introduce the Italian mode of preparing and winding silk into Bengal; but the obstacles to its introduction, from the ignorance and prejudices of the natives, and other causes, rendered its progress for several years comparatively slow. The average quantity of raw silk imported from India previously to 1770, did not exceed one hundred thousand pounds weight; and this, too, of a very inferior description, and worth only from a third to a half of Italian silk. In 1780, the imports from India amounted to about two hundred thousand pounds weight; and, in 1800, to nearly five hundred thousand pounds weight. Since that time they have continued to increase in a still greater proportion, the quantity of Bengal silk imported in 1823 having been upwards of one million two hundred thousand pounds weight, and of an exceedingly improved quality. The price of Italian raw silk is stated in the Second Report of the Lords' Committee on Foreign Trade, (page 4,) to be from thirteen to twenty-six shillings a pound, exclusive of duty, and that of Bengal from twelve to twenty-five shillings a pound. But as only one crop of raw silk is annually produced in Italy, while *from two to three crops are produced in the same period in India,* a very great reduction of *price may be* expected the moment these absurd and jealous regulations are removed, which prevent the free application of European c and skill to the culture and preparation of I silk.

The following is an official account of the tities of raw and thrown silk imported into Britain in the year ending the 5th January 1

Countries from whence Imported.	Raw Silk.	Thrown Silk.	Tot
Germany, . . .	35,689		
Holland, . . .	1		
Flanders, . . .	1,171		
France, ...	396,355½	1	
Portugal, . . .	179		
Spain, ...	1,300¼		
Gibraltar, . . .	5,784¼		
Italy, ...	196,787¼	359,640⅛	
Malta, ...	381		
Turkey, . . .	203,059		
W. E. British, .	44		
Ditto Foreign, .			
Bengal, ...	1,218,661¾		
China and Persia, .	932,717		
Lbs.	2,452,130	359,641⅛	2,811

During the same year, the exports amoun only fifty-three thousand six hundred pounds w of which forty thousand were to Ireland. imports of silk into Britain during the year e *5th* January 1825, amounted to three mil *three* hundred and eighty-two thousand, hundred and fifty-seven pounds weight, of which one million, seven hundred and sixteen thousand, seven hundred and thirty-two pounds, were furnished by Italy, and one million, three hundred and seven thousand, three hundred pounds, came from the East Indies and China.

In the year 1825, the silk trade was at a high pitch; and, as a staple article, added greatly to the revenue of the country, as will be seen from the above table, exhibiting the immense quantity of raw silk imported. Besides, it afforded employment to a great many individuals. Mr Wilson, a well informed and extensive silk manufacturer of that time, said, " I calculate that forty thousand are employed in throwing silk for the weaver, whose wages will, I think, amount to £.350,000 sterling. I estimate that half a million of pounds of soap, and a large proportion of the most costly die stuffs are consumed, at a farther expense of £.300,000; and that £.265,000 more are paid to sixteen thousand five hundred winders, to prepare it. The number of looms may be taken at forty thousand, and, including weavers, warpers, mechanics, harness makers, enterers, twisters, cone-spreaders, quill-winders, and draw-boys, at two hands to a loom, will employ eighty thousand more persons, and the wages amount to three millions sterling. If we include infants and dependents, about four hundred thousand mouths will be fed by the silk manufacture, the value of which I estimate at TEN MILLIONS."*

At the same period, Mr Hale of Spitalfields estimates the number of persons supported by the silk manufacture at five hundred thousand; but this was probably too high an estimate for the time. Since that time, however, the trade has greatly increased, and we have no doubt but half a million must be somewhat near the number now employed.

These statements are sufficient to show the very great and increasing importance of the British silk manufacture. So extended and rapid has been its improvement, that it has now become of considerably greater magnitude and value than that of France! M. Chaptal, who had the best means of obtaining accurate information on the subject, states, in his valuable work,† that "France does not, in ordinary years, produce more than a *million* of pounds of raw silk, and that the whole quantity consumed in the French manufacture, is not more than double that amount." Neither is it in extent only that we have begun to surpass our ingenious and enterprising neighbours; for, though they still continue to excel us in the manufacture of the lighter fabrics, we have obtained an unquestionable superiority over them in the manufacture of gloves and hosiery, as well as in that of poplins, tabinets, and all those mixed fabrics of which silk is the basis, and we are also already rivaling them in the brightness of our colours and the durability of our dies. The existing prejudice in favour of French silks, is, beyond all doubt, to be ascribed principally to the difficulty of obtaining these articles; for, it is stated in the evidence before the Lords' Committee, that the greater proportion of the silks professing to be smuggled, disposed of in London and other places, is of British manufacture,—brought from Spitalfields and Manchester,—and not, as our ladies implicitly believe, from Lyons and Marseilles.

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* *Second Report of the Lords' Committee*, p. 39.

† *Sur l'Industrie Françoise*, tom. ii. p. 118.

About the year 1780, the breeding of Silkworms was again revived in Britain. We find, from the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce, that, on the 1st February 1785, the silver medal was awarded to Miss Henrietta Rhodes, of Cann Hall, near Bridgenorth, for her sedulous attention to, and judicious observations on, the breeding and treating of Silkworms.

To show their progress and rapid increase, we may mention, that Miss Rhodes got a dozen of Silkworms in 1782. She was then quite unacquainted with the mode of treating them; but, by care, preserved them in health, and they produced a number of eggs

In May 1783, about thirteen hundred larvæ were produced from the eggs, and she was so fortunate as to lose very few during the whole time of feeding, and obtained from them twelve hundred and seventy-five cones, which produced nearly four ounces of fine silk. All the eggs laid by the moths after their transformation were carefully preserved, and, on the 12th of the succeeding May, she placed them in the sun, when they hatched in incredible numbers; and although she did not count every caterpillar, she supposed them to amount to more than ten thousand. She fed them with lettuce leaves for the first week, and then from three or four mulberry-trees, which grew in some adjacent gardens. However, as they grew larger, they became so extremely voracious, that Miss Rhodes felt the utmost apprehensions lest a famine should ensue. Her solicitude for the animals increased her exertions, and she sought after mulberry-trees with devoted anxiety, and the acquisition of a new one gave her great satisfaction. By perseverance her resources were augmented to the number of twelve trees, although some of them were at the distance of twelve miles from her residence. Such was the quantity these creatures devoured, that a bushel of leaves, crammed in as close as possible, would frequently be insufficient to support them one day.

Miss Rhodes had high anticipations of success, but a dreadful night of thunder in the latter end of

June, which spread general alarm throughout England, deprived her of thousands of her insects. On visiting her manufactory early next morning, she found that the lightning had struck several of the pans; at least such was her belief, for she could not believe that the sound of the thunder should occasion such appearances. A large pan immediately opposite to the window, containing about five hundred Silkworms, was full of a liquor as yellow as gold, and all the little animals who had been its inhabitants were dead, and scorched up as by the influence of fire, while others of the pans had only been partially affected. She removed all the dead: but her misfortune did not end there, for three succeeding days presented her with such numbers who had equally felt the baneful effects of the lightning, that her immense stock was reduced to two thousand eight hundred and ninety-three: these were, however, exceedingly healthy, and began spinning their cones on the 7th of July.

During all this time Miss Rhodes had no other assistance than a servant; the pans were cleaned out once a-week, and the animals fed three times a-day. So small a portion of her time was taken up by attending the worms, that neither her amusements nor avocations were interrupted by it.

Miss Rhodes found, that the average number of three hundred and sixty cones produced an ounce of silk; and she had, from the remainder of her stock of that summer, exactly half a pound of silk, all of one uniform colour and height of gum. She had, besides, of the waste silk with which the cones are surrounded, somewhat more than a quarter of a pound, which she had carded and wove into stockings at Nottingham.

From the statement given by Miss Rhodes, it would appear that it requires thirty thousand to produce five pounds of silk; and she found that ten mulberry-trees, absolutely stripped, were barely sufficient to supply the wants of ten thousand caterpillars. She tried to feed worms on all the different leaves of a large and variously stored kitchen-garden, but they would not eat any but lettuce and spinage, and they perished on these in a very short time, owing, she imagined, to their moisture and coldness.

The criterion to judge of the goodness of silk is, by the height of the gum; and that of Miss Rhodes, in that respect, outstripped Italian silk. She accounted for it in this way, that in Italy the chrysalis soon bursts, and the imago is destroyed to prevent them eating their way out of the cone, in which case they are sure to injure the silk; and, to effect this, they are placed in heated ovens. In Britain, where progress is slower, there is sufficient time to wind off the silk, without killing the chrysalis. Miss Rhodes frequently wound the cones out of boiling water, placing them afterwards on dry paper, and she always found that the chrysalis was uninjured by this mode of treatment, and that the moth was regularly transformed at its proper time.

If, therefore, the chrysalis can bear so great a degree of heat as boiling water, it is obvious that the warmth of the ovens, and the length of time it is necessary to keep it there, to ensure its destruction, must greatly injure the strength and glossy hue of the silk. But this is not all, for in Italy they suffer the moth to eat its way out of the largest cones, in order to have eggs from the most healthy, and thereby lose all the silk in those cones. Here, the silk may be gathered, as well as the moth preserved; and thus do we possess two striking advantages, which amply compensate for the loss of many others.

In the year 1785, Miss Rhodes again tried the rearing of the Silkworm; but, owing to the difficulty of procuring mulberry-trees, she greatly limited the numbers, preserving only as many eggs as covered a sheet of writing-paper. In order that the worms might have the advantage of the hottest summer months, these eggs were not exposed until the morning of the first of June; and, before night, some hundreds were hatched, and, in a day or two, the whole made their appearance. As she had convinced herself, from experiments, that lettuce was the only food which could be relied upon next to the mulberry, she caused some large beds to be carefully cultivated. She then made trial how long they would subsist upon these without injury t their growth, or the produce of the texture of tl silk. They were so fine and healthy, that she fe them solely with lettuces till the 24th of June, b ing twenty-four days, or double the time they use to be kept from the leaves of the mulberry-tree.

In less than a week after this change of foo having attained their full growth, and exhibitir that beautiful transparency which predicts the maturity, they began to spin, and produced con as fine and firm as any she had ever had before.

By the latter end of July the whole business wa completed, and she wound exactly four thousar cones, which produced eleven ounces of silk, pr cisely the same as that of the preceding year.

Miss Rhodes did not lose more than a dozen worms when feeding; and, from the size of tl cones, thought they were equal to any produced Italy.

In a treatise on the Silkworm Moth, publish in Georgia, it appears that the cones of the cate pillars fed in that country contain three hundr yards of silk, which weighs no more than two grain Miss Rhodes measured the thread of a cone of h own breeding, and found it contained four hundr and four yards of silk, which, when dry, weigh three grains; and this was from one of the worn *which* fed only one week on mulberry leaves.

Various kinds of leaves have been employed feeding Silkworms; such as those of cowslips, blackberries, and the young leaves of the elm. Miss Rhodes, however, found, upon trying the latter, that nine out of a dozen worms died, and the other three were rescued from the same fate by giving them the mulberry leaf; but they never recovered their strength sufficiently to form a cone. So that none of these leaves can be used to any practical purpose. Their employment can only gratify the curiosity of the speculative philosopher.

The Hon. Daines Barrington suggested the idea, that all those leaves which were similar to the mulberry in taste and appearance,—such as the filbert, currant, lime, kidney beans, strawberry, chestnut, raspberry, ash, pine, &c. might be successfully employed in breeding Silkworm caterpillars; but none of them have been found to answer. They will eat the cabbage leaf in preference to any of these, and that even sparingly. But the offensive smell of these leaves renders them unfit for use in a large manufactory.

It is a singular fact, that no other species of lepidopterous insect is found to feed on the leaf of the mulberry-tree but the *Phalæna mori*, or Silkworm caterpillar. This tree, indeed, seems to be secure against the ravages of all other insects; which circumstance must excite our admiration of the divine Creator, who, in his beneficent goodness, has bountifully secured food to the insect whose labours were to be of the greatest service to man. In whatever way we turn our eye, the economy of Nature abounds in self-evident marks of divine goodness and wisdom.

In the uncertain and changeable climate of Great Britain, there is much difficulty in naturalizing any foreign animals, especially those of more genial climates; and, were it not that the eggs of lepidopterous insects are capable of resisting a great degree of cold, many species would necessarily become extinct in severe winters.

In the year 1786, Miss Rhodes had every reason to anticipate a successful season with her colony of Silkworms; having bred upwards of thirty thousand, from which she calculated on a produce of five pounds of silk. They were extremely healthy, and supplied plentifully with food, through the bounty of her friends, who sent leaves daily, even from distance of fifteen miles.

About the beginning of July, the caterpillars had attained their full growth, and exhibited a disposition to spin; but, at this crisis, a chilling north win set in, accompanied by a degree of cold little les severe than some of the winter months. Its baneful effects were visibly displayed on Miss Rhodes' little colony. Those that were ready to spin became of such icy coldness, that it was scarcely possible to bear them on the hand; they made som feeble efforts to eject the thread from their mouth but in vain, for they shrunk into the chrysalis state without being able to form even the web which encloses the cone. "This," says Miss Rhodes, "was equally new and alarming to me, and I watched them with the most anxious attention. The principle of life was as visible in them as in the chrysalises which they had spun. That this change was the effect of cold, I had no doubt; but I wished to discover how that effect was produced, and this I could only do by opening some of them. On examination, I found that the glutinous matter which forms the silk was become so highly congealed by the cold, that it resembled a strong tendon, both in appearance and tenacity; whereas I had ever found it to be perfectly fluid in those worms which were employed in spinning.

"My distress increased hourly, for thousands went off thus every day. It was sufficiently obvious that the making of fires would remedy the evil; but they were unfortunately situated over a range of warehouses, which rendered that not only dangerous, but impossible. To remove such numbers into the house was equally impracticable; but, alas! they were soon sufficiently reduced for me to adopt that plan; and, in one of the coldest days I almost ever felt, with the assistance of several of my friends, I removed them to their former apartment. There I kept large and constant fires; and the worms, as they arrived at maturity, pursued their industrious occupation with alacrity.

" From this it will be perceived, that cold, though it impedes their growth, does not essentially injure the worms until they arrive at the state for spinning; and that then a certain degree of heat is requisite to render the silk sufficiently fluid for them to eject it with ease. If I could have made fires at the first, I am sure that the dreadful havoc would have been prevented; and those who rear them for profit may readily construct places where an artificial heat may counteract the effects of an uncommon season, and prevent such a calamity. I have abundantly established the following facts:—

" *First,* That the management of the Silkworm is by no means difficult; the principal objection having been obviated by the discovery, that they may be supported so long a time on an indigenous plant, which may be procured in all situations.

" *Second,* That our climate supplies a sufficient degree of warmth to bring the Silkworm to the highest perfection, unless in very extraordinary seasons, which may be guarded against by the construction of fire-places.

" *Third,* And that the profits which arise from the manufacturing of silk are immensely advantageous, one-fourth part of the price of silk being adjudged enough to pay the whole expenses."

Mr Swain makes the following judicious remarks on the food of the Silkworm:—"That food," says he, "I am confident, will never be found in the leaves of any other tree or plant than those of the mulberry. For although Silkworms will feed on the leaves of lettuces, and will sometimes spin their web, and go through their several metamorphoses without any other food, when they have been accustomed to that from their first exclusion from the eggs, yet they will never thrive so well, become so large, or spin a web, either so good in quality or so abundant in quantity, as when they have been fed during their whole existence in the larva state on their natural food, mulberry leaves. And supposing the leaves of lettuces to be an equally proper food for them, yet the great extent of land necessary for the growth of lettuces sufficient for the consumption of any considerable number of worms, must surely render ineffectual every attempt to raise silk upon that plan."

What necessity can there be for ranging in quest of other nutriment, when the mulberry-tree itself, the acknowledged proper and natural food of these insects, will thrive and prosper in this country as well as most other trees? In very poor soils, indeed, they grow sparingly. But in soils tolerably rich, either those that are naturally so, or enriched by art, they vegetate with all the luxuriance that can *be wished.*

The chief reason alleged for the necessity of finding out a substitute for mulberry-leaves is, that these leaves are not produced early enough in this climate to become the food of the infant worms. It is well known that the leaves of the mulberry-tree seldom begin to unfold themselves before the latter end of May, or the beginning of June. It is likewise a matter of notoriety, that those few Silkworms which have as yet been bred in this island, have mostly been hatched in the beginning of May, or even earlier. From hence there has been supposed a necessity of providing some more early vegetating plant for their food, before the leaves of that tree are ready for them. That no such necessity exists is very apparent. Is it not natural to conclude, that the constitution of the air, respecting warmth, should at one and the same time expand the leaf, and hatch the insect, which was intended by the all-wise Providence to inhabit and feed on that leaf? This, we may observe, is the constant course of nature, with respect to all other insects and their food. We have every reason to suppose that this is the case with the Silkworms, and the mulberry leaves, in those countries where both are indigenous; and there cannot be the shadow of a doubt, that this effect would naturally and invariably obtain as well in this climate as any other, did not human imprudence interpose to prevent it, and art obstruct the intention of nature. The eggs of Silkworms have, in this country, been generally consigned to the care of young people, and chiefly those of the female sex. They have been preserved in bureaus, and chests of drawers, in rooms where fires have been constantly kept during the winter season. In the spring, as soon as the influence of the sun began to be powerful, the eagerness of youthful curiosity had caused them to be removed to windows, where the sun exerted its full power, or even increased in warmth by passing through the glass; and, in this situation, they have been generally forced into existence within a few hours, in a season when the temperature of the air was unfit for them, and their proper food could not be procured.

Mrs Williams has proved that the hatching of eggs of Silkworm Moths may be accelerated, and has averred, that it is even possible to hatch them in the middle of winter; and Miss Rhodes proved that they may be retarded beyond the usual time. For she found that, in 1783, her Silkworm eggs were not hatched until the 2d of June, and not even then without being placed in the sunshine, and Mr Swain retarded them till the middle of June, when they were vivified by exposure to the influence of the sun's rays, the great source of life and light; and I have kept them over a whole season in a cold damp cellar, without their being *evolved:* from all which, it seems pretty evident that the eggs of Silkworms may be hatched at almost any time. But certainly the most proper season is at the time the mulberry is in leaf, at least to those who engage in the breeding of them for mercantile purposes.

The chief reasons for recommending the full foliation of the mulberry-tree, for the regulation of this matter, are these: The first is, that there may be a sufficient store of their natural food ready for the young worms as soon as they are excluded from the eggs, which will preclude all necessity for seeking after other food. A second is, that these worms being originally natives of a warm climate, may be sure to be brought to life when the air is of a temperature congenial and agreeable to them, since it is a general observation among gardeners, that when the mulberry-tree begins to expand its foliage, it is a certain sign of the near approach of fine, warm, settled weather. A third reason is, that the mulberry-trees may be permitted to put forth a good quantity of leaves before any of them are plucked, that so they may not suffer so much in health from being stript of their foliage as they otherwise would do, and may be equal to the support of a much larger stock of insects. For it is certain, that the leaves are as necessary to the life of a vegetable as the skin or the lungs are to that of an animal. If, therefore, most of the young leaves are immediately cropped off as soon as they expand, the consequence undoubtedly will be, that the tree will be so backward and retarded in putting forth its leaves, that it will not produce near the quantity it otherwise would have done, and, if this usage is often repeated, will ultimately be destroyed.

Considerable pains have been taken to rear the Silkworm, and to encourage the manufacture, at Perlac, a small town of thatched houses in Lower Hungary. The manufacture was formerly in the hands of the proprietors of the island, but the comitatus has now purchased it. The Silkworms are reared by the peasants, who bring the cocoons to Perlac, where they are paid for them by the agent of the comitatus. Mulberry-trees, which have been planted as the common property of the neighbourhood, grow on each side of many of the roads. Upon the whole, however, the cultivation of Silkworms does not flourish. The quantity of cocoons has sometimes amounted to fifty centners, which yield, under proper management, about one-ninth part of good silk; but even this is above the present produce.

Many attempts made in other parts of Hungary to rear these insects have been attended with some success. They were first introduced into the Banat by Count Mercy, about the year 1734; but the Turkish war breaking out in 1739, forced him to relinquish the pursuit. In 1765, the Empress Maria

Theresa did her utmost to encourage the cultu and afterwards the Emperor Joseph construc buildings for the purpose, planted mulberry-tr brought Italians into the country who had b accustomed to the management of the worms their silk, and endeavoured to encourage the peasa to rear them in their own cottages. By these me the produce of silk was so much increased, that H gary, which, in 1765, yielded but 183 pfunds wound silk, produced, in 1785, not less than 13,1 pfunds. This branch of industry has not, howev proceeded so rapidly since that time; and the great yearly produce which has been known was in 18 when the royal silk establishment produced 1 centners, and those of private individuals probal about 30 centners. By far the greater part of comes from districts of the military frontiers, e tending along the south of Hungary. The cultu of the Silkworm is not, however, confined to the limits, but private establishments, both for reari the worms and purchasing the cocoons from t peasants, are found in the Biharer, Bekeser, Pesth Heveser, Weszprimer, and Neutraer counties, a in the towns of Lombor and Tyrnau.

In the year 1802, Joseph Blaschkowitsch, w had devoted attention to the subject, invited t landholders to witness a trial, instituted under t encouragement of government at Ofen, of his in proved method of rearing the Silkworm. The g objects he proposed were to diminish the time that elapses between the hatching of the egg and the obtaining of the pure silk, so that it might not interfere with the occupations of the agriculturist, and he found he could reduce this period from nine to five weeks. He likewise found means to feed the worms, produced from half an ounce of the eggs, upon the leaves of six mulberry-trees, which before had required from twenty to twenty-six. From every half ounce of eggs he procured fifteen or twenty pfunds of cocoons more than by the usual process; and from eight to ten pfunds of cocoons he obtained one pfund of pure silk, whereas twenty or thirty pfunds had formerly been necessary for the same produce: This method farther enabled a peasant, who could before manage only half an ounce of eggs, now to rear the worms from half a pfund. The means which he employed were chiefly intended to reduce each different process in the eventful lives of these little animals to a regular period, that every one might run his course as nearly as possible within the same time. With this view, he discarded most of the artificial methods which had been adopted for hatching the egg, and, without exposing them to the partial heat of the sun, to warmed pillows, or to the warmth of the bosom, all of which were practised, placed them in a situation where they might be equally affected on all sides by the surrounding atmosphere. He in-

troduced the use of seed mats, which
many respects, superior to paper, for r
eggs; and as all the cocoons were finish
he was able to destroy all the chrys
same time. For this purpose, he con
oven in which he killed the animals in
ners of cocoons in twenty-four hours, ar
vention could speak with confidence as t
of the changes, in the following terms:
12th of May the worms will begin to
their eggs; seven days afterwards the
of the skin will take place, which
twenty-four hours; at the end of anoth
second change of the skin will commence
last for two complete days; seven
wards the third change will occur,
occupy three days; and in seven days
will change their skin for the fourth an
a process which will continue for fou
eight days from this time the whole of th
will begin to spin; in five days more t
will be completed; so that, on the sixt
may be taken from the places where
spun, and exposed a day before the wi
mences."

Blaschkowitsch afterwards published
of much authority on the subject. I
establishment was instituted at Foth A
Pesth, which was put under his guidan

1812, Stephen Von Begh, Obergespaun of the Baranga comitatus, brought him to Fünfkirchen to give instructions upon the subject publicly, which he did with great effect, and seemed at the time to infuse much ardour into those he taught.

The greatest attention was paid to this subject in the Banat and the military frontier provinces, where the peculiarity of the constitution, as a military government, gives a singular facility to authoritative interference; and the following abstract of the regulations, issued in 1805, presents an illustration by no means devoid of interest, of the mode in which that interference is directed.

In order to give greater spirit to the culture of silk in the district of the frontier Banat regiment, by the practical education of scholars, the general frontier direction, after deliberation with the masters of the schools, commanded that the holydays, which had hitherto been kept in the months of September and October, should, in future, be transferred to the months of May and June, and that, during them, the scholars should be employed in the management of the Silkworms, under the inspection of a teacher; one-half of the profits to be given to the teachers and their assistants, and the other half to the scholars who applied themselves diligently to the pursuit; amongst whom, the four who most excelled were to receive double shares. The stands upon which they kept Silkworms were, in the first place, to be paid for by the government, and afterwards to be kept in repair out of the profits. In addition to the extensive mulberry plantations which already existed, all other open places, particularly the churchyards, were to be planted with these trees; and to every person who employed himself in rearing Silkworms a certain number of trees was to be assigned.

The gathering of the leaves was first to be performed by the scholars, under the inspection of their superiors. Whosoever intentionally injured a mulberry-tree was called upon to plant fifteen, and to be answerable for their growing. According to an order issued in the preceding year, the inhabitants of the frontier regimental districts were obliged to make good the decayed mulberry-trees, by means of new plants, and were, in a particular manner, directed to take one of the mulberry plantations. By means of these and similar ordinances, the progress, both as to the quality of silk produced, and as to the number of mulberry-trees, was very considerable. In October 1806, it was found that, in the southern military frontiers, without including those of Transylvania, which are more to the east, there were 706,731 trees of this species, making an increase, during the last year, of 17,929. Proper officers were appointed for the inspection of all the different processes, both in the culture of the mulberry, and in the rearing of the worms, and the most approved books upon the subject were widely circulated.

As the result of their regulations, we find, during the three subsequent years, a rapid increase in the quantity of silk; so that the yearly produce in these military frontiers, and the sums paid by government to the cultivators, were as follows:—

In 1806,—546 cent.	3½ pf.	of cocoons,	357,44 fl. 5¾ kr.
1807,—1066	89⅔ pf.		918,16 fl. 35 kr.
1808,—1430	93½ pf.		130,912 fl. 53¾ kr.

These were, however, the periods of its greatest success. Bad seasons followed. In 1810, the quantity was reduced to 710 centners, for which 71,705 fl. were paid; and the same cause, accompanied likewise with unfavourable political events, has given a very material check to this branch of industry, which appeared to be acquiring importance and stability. The Hungarian character, and the habits of all the peasantry of this country, are undoubtedly but little suited to the peculiar attention and minute care which are requisite for the pursuit of an employment so strictly domestic; and the reward to which they can look with certainty, is but an inadequate return for the labour and restraint to which they are subjected. The government has not, indeed, a monopoly in this article: the market is open to any private speculator; still but few purchasers offer themselves, and the peasant is generally obliged to be contented with the rate fixed at the royal establishments, where he receives from thirty kreutzers to a gilder for a pfund of cocoons, according to the state in which they are brought.

In the year 1810, the Ritter Von Heinth instituted trials in the Banat military frontier, under the countenance of government, with a view to naturalize the Silkworm in the open air; and the following account, written by one who bore part in these attempts, will be read with interest:—

" In pursuance of the orders of the commandant-general, of 27th June 1810, by which the agricultural officers of this district were required to make experiments, under the direction of the Ritter Von Heinth, with a view to accustom the Silkworm to the climate of the country, trials were actually made during the last spring in the following places:—At Porlasvaros, with one loth (half ounce) of eggs; at Thomashevaez, with one half loth; at Oppova, with one loth; at Glogon, with one loth; at Jerkovaez, with one half loth; at Alibunar, with one loth; at Kubin, with one half loth; at Grebenácz, with one half loth; at Isbistie, with one half loth; at Neudorf, with one half loth; at Panscova, with several loths, both on single trees, and in the mulberry plantations.

" The weather proving fine, the eggs, at the end of April and the beginning of May, were fastened in boxes secured with a cover upon the trees, and freely exposed to the sun. As the weather varied a little in different places, the eggs were not hatched exactly at the same time; but where much rain and considerable changes in the atmosphere occurred, the worms began to appear on the 10th or 12th day, which was the case with almost all that were put out in April. Where the weather was fine and dry, they crept out upon the fifth day. As soon as this had taken place, the covers of the boxes were removed, the nearest branches of the trees were bent down into the boxes, and an opportunity was thus given to the little animals of seeking their own nourishment, and of distributing themselves gradually over the trees.

"At Jerkovaez, Thomashevaez, Alibunar, and Neudorf, in the north-eastern part of this flat district, the little race was in a short time completely destroyed by storms and sudden showers. In other places they attained to different sizes, according as the atmosphere was more or less disturbed. They had already passed through their first sleep at Glogon, Porlasvaros, and Isbistie, and even through their second at Grebenácz, when hail storms, showers, and gusts of wind, cast them down from the leaves, and they perished.

"At Homoliez, Oppova, Starcsova, Kubin, and Panscova, in the south, where no hail fell, the Silkworms survived till the period of spinning, without being injured by the casual rains of the cold nights frequent in that district; but hard showers washed down many of the large and heavy worms. Other dangers also threatened the destruction of these little colonies—dangers which increased with their growth, and will remain as obstacles to the culture of the silk in the open air, even though the difficulties of the climate should be overcome. Birds, particularly sparrows and starlings, killed a great number; and others, as they approached the period of spinning, fell from the trees, and were crushed. It is only at Oppova, Starcsova, and Panscova, that a few actually spun. At Oppova thirty-one came to perfection, and fifteen male and sixteen female moths ate through their cones; six only of the former and three of the latter had strength enough to come forth, and then laid eggs upon their cocoons, which in time produced other Silkworms, which died. At Starcsova, one cocoon only was found. The worms at Panscova, which were placed upon the trees by the wayside and in the plantations, suffered the same fate as the rest. The birds destroyed the greater part; others were washed away by the rain; the rest, for most part, when they had undergone their second change of skin, fell to the ground by their own weight, where they were crushed, or lay quite unable to assist themselves. On the thick espaliers in the plantation, they were, in every respect, the most secure, as they were less exposed to the wind and birds. The fall from the lower leaves was less dangerous, and recovery easier. Here many worms came to perfection, spun, crept from their cocoons, and, in twenty-four different places, eggs were deposited; the moths laid their eggs thickly together in irregular forms, never upon the leaves, but upon the bark of the trunks or the branches.

"From these trials, it appears that the climate does not of itself prevent the eggs from hatching, and that an ordinary rain, even of some duration, and the coolness of the nights, are not injurious to the worms; but it is certain, that the longer they are, and the more heavy they become, the more helpless they appear; and that, on account of the little power they possess of attaching themselves firmly to the trees, when compared with other animals of a similar kind, they are badly protected, and fall very frequently to the ground, It will be seen, whether the insects, procured from eggs laid in the open air, possess greater power of holding themselves on the trees, provided the eggs are not destroyed by the weather, or by ants, before the spring arrives."

Such is the disastrous history of this tender colony; and those which were established in the Walacho-Illyrian frontier shared nearly the same fate. The trials were repeated in 1812, and proved equally unsuccessful.

Austria has long been celebrated for its manufacture of silks. Of the richest silks, the museum of Vienna boasts a large variety; but this manufacture, once so flourishing, was almost totally destroyed by the effects of war. Before the French Revolution, it employed, at Vienna alone, six thousand looms. In 1803, it was reduced nearly one-third. In 1814, many establishments had been given up, and others were on the decline. Since which time, it has again assumed more importance, although it is believed it will never reach its former state. Many most beautiful articles of rich embroidered silk are to be found in the palaces of the wealthy, or the museum of the Emperor; but this fabric has been discontinued, and the looms, since 1812, have been chiefly employed in weaving shawls, to which all the females of the capital continue to give great encouragement. Vienna is the chief, but not the only, seat of silk manufacture in Austria, other principal towns participating to a small extent.

The White Silkworm of China has been successfully introduced into Murcia in Spain, a province which is favourably situated for the cultivation of that insect: its southern boundaries being the Mediterranean, and presenting a salubrious climate. The produce of this species is superior, both in quantity and quality, to that from the common worms. This important improvement is due to the zeal of Don Thomas Serrano, who, after a life devoted to the happiness of his country, was forced to seek, at Gibraltar, an asylum against the persecutions of the servile factions.

Many efforts have been recently made to introduce the Silkworm, on an extensive scale, into Ireland. These, however, do not appear to have been sucessful, which must be attributed to some mismanagement in the treatment of the animal, and other circumstances; for we consider the climate much better adapted, then that of the sister island, for the breeding of this animal. We have no doubt, but if still persevered in, it might ultimately prove of great and extensive benefit to the peasantry of that country. As we have before hinted, it is our firm belief, that in time the insect might become natural ized to this latitude, under the guidance and fostering care of man. For we have seen in the higher animals, that they have been brought by degrees to breed and thrive in our island, although the temperature is widely different from that of their own.

Lord Kingston, with the most patriotic zeal, used every effort to propagate the worm, and benefit his native land; but in his efforts he has not been assisted. In the year 1827, that nobleman had upwards of *thirty thousand* mulberry-trees growing upon his estates in Ireland, and these in the most flourishing and healthy condition. He had sent to market in 1830 a considerable quantity of raw silk, of the best quality. But, we fear, the restless genius of the peasantry is ill adapted for an employment, where assiduity and careful attention are required.

In this opinion, we think we are borne out by the fate which has attended the manufactories of cotton lace. The low price of labour induced a belief that these might be successfully cultivated; but a combination of circumstances has blighted the hopes of the public-spirited individuals who introduced them. We hope that still their may be found patriots to persevere, and gain an ascendency over prejudice. The cultivation of the Silkworm and the growing of flax, if pursued with vigour, might yet render Ireland prosperous and happy.

Very lately, a remarkable phenomenon presented itself in Ireland, which goes far to support our opinions. A voluntary colony of Silkworms settled on the demesne of Mount Loftus, county of Cork, the seat of Sir Nicholas Loftus, Baronet. On this demesne, there are no mulberry-trees; but there are several of the European spindle-tree, or *Euonymus Europeus;* and of these the insect colonists took possession. One tree was literally weighed down with them; and it was supposed there could not be less than half a million of worms actively spinning their cones upon it. This remarkable circumstance is well worthy the attention of naturalists, as it proves, that the Silkworm may exist and thrive upon another tree than the mulberry. Those at Mount Loftus are said to have been in vigorous health, and to have produced excellent silk.

Time alone can prove what may be the result of feeding these caterpillars on the spindle-tree. Till then we must suppose that the mulberry is the true food of the Silkworm; and will finish our account of this highly useful insect by an account of that tree.

ON THE CULTIVATION OF THE MULBERRY-TREE.

FROM all we have above narrated, it is evident, that the first step towards the succ propagation of the Silkworm, is the ext cultivation of the mulberry-tree. It is the of botanists,—a genus of the order *Tetrand* which there are seven distinct species, nam the *Nigra,* or black fruited; the *Alba,* o fruited; the *Rubra,* or red Virginian; the *Ta* or Tartarian; the *Papyfera,* or paper mul Japan, from which paper is manufactured country,—now successfully used in France ing Silkworms. The *Tinctoria* and *In* not used for feeding Silkworms.

All the species of mulberry are hardy, cultivated and naturalized in any clima are rapid in their growth, and abunda foliage.

For cold climates it has been found that the black is the best adapted; and, besides, it has another advantage,—that of producing nearly double the quantity of leaves to those of other species. Although the mulberry grows with much vigour in moist lands, it has been found that those produced in such situations are not so nutritious to the worms, in whose constitution they induce a weakness. Hence it is found, that although in dry soils the foilage is less abundant, the reduction in quantity is amply compensated by the additional nutriment which they afford, and the consequent finer quality and even additional quantity of the silk produced.

The mulberry-tree can be easily raised either from cuttings, layers, or seeds. The plan adopted in France for raising plants from seeds is curious, as will appear from the following description:—"Take the ripe berries when they are full of juice and seeds. Next take a rough horsehair line, or rope, such as we dry linen on, with a good handful of ripe mulberries; run your hand along the line, bruising the berries, and mashing them as much as possible, as your hand runs along, so that the pulp and seed of the berries may adhere in great abundance to the rope, or line. Next dig a trench in the ground where you wish to plant them, much like what is practised in kitchen gardens in England for crops of various kinds. Next cut the rope, or hair line, into lengths, according to the length of the trench you think fit to make, and plunge the line, full of mashed berries, into the trench; then cover it well over with earth, always remembering afterwards to water it plentifully, which is indespensable to success. The seeds of the berries thus sown will grow, and soon shoot out suckers which will bear young leaves, and these are considered the best for the food of the Silkworm. The facility and rapidity with which young leaves may by this means be produced is evident; for you can fill as many rows of trenches in this way as are required, and it can never be necessary to have mulberry-trees higher than our raspberry, currant, or gooseberry bushes. Whenever they get beyond that height they lose their value; and if these branches succeed, you may have a supply coming fresh up day after day, or any quantity you please."

In climates of a similar temperature with that of Great Britain, seedlings will seldom reach above three inches in height during the first year. It is different however, in eastern countries where these seedlings are mounded, in the succeeding, for feeding the Silkworms; and a second crop is in like manner cut for the food to a second brood of caterpillars. Those experienced in the culture of Silkworms can readily recognise the silk produced by caterpillars fed on these young shoots, from the superiority of its texture. Those fed on the leaves *of the* mature mulberry, always produce an inferior *quality* of silk.

The most simple and speedy method of producing mulberry plants, is from cuttings; they are always more rapid in their growth, and stronger. But this is most successfully practised in moist climates.

The Chinese never allow mulberry-trees to grow above the height to which a man can reach. They carefully cut out the main central stem, and allow the side branches to expand in all directions, taking care to prune them when they show signs of growing high. Besides, they always cut the centre of the tree into a hollow cylinder, into which the person who pulls the leaves enters, and removes them, without damaging the trees.

It has been ascertained that the true mode of producing the most abundant crop of leaves, is to deprive the tree of all its strong and leading stems. In Tuscany considerable attention has been paid to the cultivation of the trees; and M. Nollet says the inhabitants of these provinces, particularly in Florence, do not cultivate half the number of trees which are raised in Piedmont, in proportion to the number of Silkworms which are reared, and the quantity of silk produced by them. This plan of saving, is in consequence of their causing the caterpillars to be hatched at two different seasons; the first in spring, and the second, after the first have spun their cones. In the Isle of France, M. Chazel reared three generations of caterpillars between

December and May. Whereas in Italy, it is the opinion of Count Dandolo, that the mulberry-tree cannot be twice stripped of its leaves without injuring the trees; and he alleges, that one good crop of silk is worth more than both the first and second; and that the quality of the second crop is always inferior.

That the Silkworm caterpillar may arrive at its complete state of development, the quantity of leaves which they necessarily consume must bear a relation to their quantity of nutrition. The better the quality of the leaves, less will be required for this purpose, and the animal liable to less fatigue in masticating them; so that saccharine substance, unless combined with resinous matter in a due proportion, may feed the animal, but will never enable it to produce silk proportionate to its weight.

In various parts of France and Italy, many persons rear Silkworms, who have no means of supplying them with food, except by the purchase of mulberry leaves, which are brought to the market, and sold by weight. It therefore requires not only judgment, but experience, to enable the purchaser to distinguish such as are most nutritive.

Great care must be taken to prevent the leaves from heating, and thereby producing the first stage of fermentation, which destroys their quality, and proves too stimulating for the Silkworms; and they should also be presented to the animals in a perfectly dry state, otherwise contagious and other fatal diseases will ensue.

It is a remarkable fact, that no other insect whatever but the Silkworm feeds upon the mulberry-tree. Various caterpillars have been put on the leaves of mulberry-trees, but they have always been found to reject them. Even the *Aphides*, some species of which are found on almost every other plant, have never been discovered on this tree.

END OF VOLUME SECOND.

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